American Journal of Plant Biology
2023; 8(2): 30-35
http://www.sciencepublishinggroup.com/j/ajpb
doi: 10.11648/j.ajpb.20230802.12
ISSN: 2578-8329 (Print); ISSN: 2578-8337 (Online)

Response of Farmyard Manure (FYM) on Growth and Flowering of Different Marigold (*Tagetes erecta* L.) Varieties

Ajay Kumar[1], Ali Raza Jamali[1, *], Tanveer Fatima Miano[1], Roshan Lal[2], Abdul Wahab Soomro[3], Munesh Suthar[1], Shuaib Ahmed Magsi[4], Aneel Kumar[5]

[1]Department of Horticulture, Faculty of Crop Production, Sindh Agriculture University, Tandojam, Pakistan

[2]Department of Agriculture Extension, Balochistan, Pakistan

[3]Central Cotton Research Institute Sakrand, Sindh, Pakistan

[4]Department of Agronomy, Faculty of Crop Production, Sindh Agriculture University, Tandojam, Pakistan

[5]Department of Soil Science, Faculty of Crop Production, Sindh Agriculture University, Tandojam, Pakistan

Email address:

alijamali752@gmail.com (Ali Raza Jamali)

[*]Corresponding author

To cite this article:

Ajay Kumar, Ali Raza Jamali, Tanveer Fatima Miano, Roshan Lal, Abdul Wahab Soomro Munesh Suthar, Shuaib Ahmed Magsi, Aneel Kumar. Response of Farmyard Manure (FYM) on Growth and Flowering of Different Marigold (*Tagetes erecta* L.) Varieties. *American Journal of Plant Biology*. Vol. 8, No. 2, 2023, pp. 30-35. doi: 10.11648/j.ajpb.20230802.12

Received: June 1, 2023; **Accepted**: June 25, 2023; **Published**: July 6, 2023

Abstract: Farmyard Manure play an important role for healthy growth and flower production of ornamental and seasonal flowers. Hence, FYM with all essential nutrients and good water holding capacity for better growth and flowering of landscape plants need to be evaluated properly. The pots experiment was performed during winter 2022-23 to observe the growth and flowering response of marigold to Farmyard manure. The trail was layout in Completely Randomized Design-Factorial with three replications the trail was layout at The SAU Nursery, Sindh Agriculture University, Tandojam. The plants of about one month old of two marigold varieties (African yellow & African orange) was transplanted in earthen pots farmyard manure in (1:1) was used. Canal Silt and Farmyard Manure used as treatment. The results revealed that the marigold varieties and farmyard manure material had a significant ($P<0.05$) influence on all of the examined parameters in this study. Most of the marigold's growth and flowering characteristics were observed the canal silt + farmyard manure (1:1) with African yellow variety performed better result in all parameters. producing the highest plant height (21.82cm), flower diameter (5.45 cm), flower weight (9.33g), width of leaves (0.40cm), plant spreading (14.43cm) number of leaves plant^{-1} (205.66), number of flowers plant^{-1} (16.83) length of leaves (2.51cm), number of branches plant^{-1} (20.49) was record in African yellow variety. whereas African Orange variety performed poor result in all parameters. Whereas the canal silt + farmyard manure (1:1) performed good result producing the highest plant height (21.24cm), flower diameter (5.56 cm), flower weight (12.23g), width of leaves (0.38cm), plant spreading (21.19cm) number of leaves plant^{-1} (240.83), number of flowers plant^{-1} (23.16) length of leaves (2.66 cm), number of branches plant^{-1} (25.33) in canal silt performance poor result. Based on findings of the present study it was concluded that the growth and flowering response of marigold was better when it was nourished with canal silt + farmyard manure (1:1). In case on varieties, the performance of African yellow was better in terms of growth-related traits.

Keywords: Marigold, Canal Silt, Farmyard Manure, African Yellow and African Orange

1. Introduction

Marigold (*Tagetes erecta* L.) belongs to the family: Asteraceae and it is native to South and Central America especially Mexico. It is grown all over the world and accounts for more than half of the country's loose flower production [16]. Erect Tagetes plants are naturally tall, erect depending on the species from 0.1 to 2.2 m, consisting of many branches, large in size of flowers, and the color varies from variety to variety [22]. Marigolds are one of the most widely used flowers for religious holidays and cultural

events, wreaths, flower decorations, flower baskets, cut flowers, bedding, making garlands between pots, and are also used to make various products [21]. Calendula is also used in the production of natural products used in flour production, preparation of natural dyes, oil extraction, dyes, pharmaceutical ingredients, mainly suitable for the extraction of xanthophyll, etc. [14]. Currently, many industries are interested in the growth of marigolds because of the potential added value. In most flower crops, flowering and yield largely depend on the number of flowers with branches, by controlling the vertical growth of plants and stimulating the lateral branches by pinching the apical buds [9].

Marigolds have smaller flowers and leaves than most other marigolds. Plants decorate the sunny places of the landscape and attract attention. In addition, amaranth is a very valuable crop for fighting nematodes that parasitism on plants, [06] The aboveground part of the plant contains high-quality essential oils that can be used for the aromatization of soaps in the perfume, cosmetic and pharmaceutical industries. Mycorrhizal symbiosis of arboreal mycorrhizal is widely believed to protect host plants from the harmful effects of drought [18]. Increased water absorption at low soil moisture levels as a result of non-root hyphae. Marigolds are usually annuals that respond to fungal infections, but they do not always show a significant response under restricted conditions Upright Tagetes is the 3rd most important cut flower in the world market after roses and carnations. The flowers of this plant have different colors. They are in great demand and are especially appreciated on Easter and Mother's Day [7] T in short light intervals. It is recommended to achieve Erecta flowering [2] The plant has a longer flowering period, so it can be used in a variety of situations in the home garden [11] Upright Tagete flowers can also be used zipal T sheets of natural yellow-orange pigment helenin (xanthophyll), which is in great demand among national and international companies [2 & 3] Elekta as a tea with spices (sitkovich et al. It was revealed that the two men had been involved in a series of incidents in which they had been involved in a series of incidents. Upright Tagetes can be used in different situations of home garden and landscape design. 1. This is one of the best plants for planting in rock gardens, flower beds and balconies. In addition to having pesticide properties against nematodes and some pests common in the garden, this plant is also considered a snake repellent in the garden [19]. The choice of a good nutrient medium is the basis for the proper management of the nursery and the basis for a healthy root system. Nutrient media for use in container nurseries are available in 2 main forms: soil and organic systems [12] Compared with soil medium, its main component is field soil, organic medium (the basis of organic matter, which can be compost, peat, sawdust, rice husk, coconut, bird droppings, etc.). Or other organic substances mixed with inorganic components) contribute to better root growth. In temperate climates, nurseries include algae, vermiculite and perlite, as well as pre-mixed mixtures of these ingredients, but most nurseries in the tropics do not have easy and affordable access to these materials, and even nurseries in temperate climates use these materials with local eco-friendly materials. It tends to replace some of the components. In the tropics, producers often use local ingredients to make their own mixtures. A good growth environment consists of two or more components. Producers need to be aware of the positive and negative properties of the various ingredients and how they affect plant growth, even when creating a suitable nutrient medium or even when buying a commercially available medium [20 & 10] it is one of the most important annual flowering crops in the international flower trade and grows widely to decorate landscape gardens, interior decoration and make garlands. However, few studies have focused on the growth and productivity of this ornamental plant in a local potted environment in Nigeria [9 & 1] It is also necessary to determine the appropriate composition of the nutrient medium, which promotes early rooting and growth of annual ornamental plants. Erecta in agroecology in southeastern Nigeria. Thus, the purpose of this study was to evaluate the effectiveness of six different nutrient media for seedlings from local materials (consisting of different proportions of topsoil/bird droppings/river sand) for specific parameters of trictor growth and productivity. Pinching is the process of removing the apical shoots with several leaves. When pinching, flowering is delayed, but the number of flowers increases. The pinching work is done on marigolds and is well proven in floriculture, but information about the double pinching effect of marigolds is limited. The main purpose of this operation is to stimulate branching to obtain dense growth and/or more flower formation, and to increase the yield of flowers and seeds. pointed out that after 30 days after transplantation, plant height (80.20cm) was significantly reduced compared to the marigold control (63.52cm). [8]

2. Material and Methods

The present research was conducted at The SAU Nursery, Sindh Agriculture University, Tandojam. During winter 2022-23. were two marigold varieties are transplanted into canal silt and farmyard manure V_1=African yellow V_2=African orange were subjected to response of farmyard manure (1:1). The experiment was layout in Completely Randomized Design (CRD)-factorial with three replications. Different parameters were observed respectively. The growing media were prepared with canal silt + farmyard manure (1:1). Seedlings of marigold were transplanted in Pots. Irrigation was applied after two days. The Data was analyzed by using statistical analysis software Statistix 8.1 (Statistix, 2008). In order to compare treatment superiority and performance, the least significant variance (LSD) assessment was practical at ($P<0.05$) possibility equal.

2.1. Data Recording Methodology

Plant height, plant spreading, length of leaves, width of leaves, all parameters was measured from bottom to top with measuring tape.

Number of leaves plant^{-1}, branches plant^{-1} and flowers

plant^{-1} number of leaves plant^{-1}, branches plant^{-1} and flowers plant^{-1} were counted visually at the end of experiment from randomly three plants of each treatment.

2.2. Flower Diameter

The flower diameter was measured with vernier caliper.

2.3. Flower Weight

The flower weight was measured by electrical weight balance machine.

3. Results and Discussion

3.1. Plant Height (cm)

Result pertaining to plant height (cm) presented in (Table 1) showed significant effect of Farmyard manure. The maximum plant height (21.24cm) was recorded in Canal silt + FYM (1:1) were as minimum plant height (17.56cm) was recorded in only canal silt. Among the varieties, African Yellow and African Orange had statically significant (P<0.05). The maximum plant height (21.82cm) was recorded in African Yellow, were as the minimum plant height (16.99cm) was recorded in African Orange.

Table 1. *Plant height (cm) as Affected by Farmyard Manure.*

	Varieties		
Treatment	African Yellow	African Orange	Mean
Canal Silt	21.06	14.06	17.56b
Canal Silt + FYM (1:1)	22.56	19.93	21.24a
Mean	21.82a	16.99b	
	Growing Media	Varieties	GM x V
S. E±	2.3691	2.3691	3.3505
LSD 0.05	5.4632	5.4632	7.7262
Probability Value	0.1586	0.0765	0.3837
Fisher Value	2.42	4.13	0.85
CV %	21.14		

3.2. Flower Diameter (cm)

Result pertaining to flower diameter (cm) presented in (Table 2) showed significant effect of Farmyard manure. The maximum flower diameter (5.56cm) was recorded in Canal silt + FYM (1:1) were as minimum flower diameter (3.63cm) was recorded in only canal silt. Among the varieties, African Yellow and African Orange had statically significant (P<0.05). The maximum flower diameter (5.45cm) was recorded in African Yellow, were as the minimum flower diameter (3.74cm) was recorded in African Orange.

Table 2. *Flower Diameter (cm) as Affected by Farmyard Manure.*

	Varieties		
Treatment	African Yellow	African Orange	Mean
Canal Silt	4.10	3.16	3.63 b
Canal Silt + FYM (1:1)	6.80	4.33	5.56 a
Mean	5.45 a	3.74 b	
	Growing Media	Varieties	GM x V
S. E±	0.48	0.48	0.68
LSD 0.05	1.11	1.11	1.57
Probability Value	0.00	0.0078	0.1503
Fisher Value	16.10	12.44	2.53
CV %	18.14		

3.3. Flower Weight (g)

Result pertaining to flower weight (g) presented in (Table 3) showed significant effect of Farmyard manure. The maximum flower weight (12.23 g) was recorded in Canal silt + FYM (1:1) were as minimum flower weight (7.98 g) was recorded in only canal silt. Among the varieties, African Yellow and African Orange had statically significant (P<0.05). The maximum flower weight (10.88 g) was recorded in African Orange, were as the minimum flower weight (9.33 g) was recorded in African yellow.

Table 3. *Flower Weight (g) as Affected by Farmyard Manure.*

	Varieties		
Treatment	African Yellow	African Orange	Mean
Canal Silt	6.86	9.11	7.98b
Canal Silt + FYM (1:1)	11.80	12.66	12.23a
Mean	9.33b	10.88a	
	Growing Media	Varieties	GM x V
S. E±	1.3499	1.3499	1.9091
LSD 0.05	3.1130	3.1130	4.4024
Probability Value	0.0563	0.0517	0.4618
Fisher Value	4.97	5.30	124.08
CV %	22.68		

3.4. Width of Leaves (cm)

Result pertaining to width of leaves (cm) presented in (Table 4) showed significant effect of Farmyard manure. The maximum width of leaves (0.38cm) was recorded in Canal silt + FYM (1:1) were as minimum width of leaves (0.30cm) was recorded in only canal silt. Among the varieties, African Yellow and African Orange had statically significant (P<0.05). The maximum width of leaves (0.40cm) was recorded in African Yellow, were as the minimum width of leaves (0.28cm) was recorded in African Orange.

Table 4. *Width of leaves (cm) as Affected by Farmyard Manure.*

	Varieties		
Treatment	African Yellow	African Orange	Mean
Canal Silt	0.40	0.2	0.30b
Canal Silt + FYM (1:1)	0.40	0.36	0.38a
Mean	0.40a	0.28b	
	Growing Media	Varieties	GM x V
S. E±	0.0667	0.0667	0.0943
LSD 0.05	0.1537	0.1537	0.2174
Probability Value	0.2466	0.1182	0.2466
Fisher Value	1.56	3.06	1.56
CV %	33.80		

3.5. Plant Spreading (cm)

Result pertaining to plant spreading (cm) presented in (Table 5) showed significant effect of Farmyard manure. The maximum plant spreading (21.19cm) was recorded in Canal silt + FYM (1:1) were as minimum plant spreading (9.73cm) was recorded in only canal silt. Among the varieties, African Yellow and African Orange had statically significant

(P<0.05). The maximum plant spreading (14.43cm) was recorded in African Yellow, were as the minimum plant spreading (7.49cm) was recorded in African Orange.

Table 5. *Plant Spreading (cm) as Affected by Farmyard Manure.*

	Varieties		
Treatment	African Yellow	African Orange	Mean
Canal Silt	7.13	12.33	9.73b
Canal Silt + FYM (1:1)	21.73	20.66	21.19a
Mean	14.43a	7.49b	
	Growing Media	Varieties	GM x V
S. E±	1.4575	1.4575	2.0613
LSD 0.05	3.3611	3.3611	4.7533
Probability Value	0.0000	0.1940	0.0638
Fisher Value	61.89	2.01	4.62
CV %	16.32		

3.6. Number of Leaves Plant^{-1}

Result pertaining to number of leaves plant^{-1} presented in (Table 6) showed significant effect of Farmyard manure. The maximum number of leaves plant^{-1} (240.83) was recorded in Canal silt + FYM (1:1) were as minimum number of leaves plant^{-1} (83.33) was recorded in only canal silt. Among the varieties, African Yellow and African Orange had statically significant (P<0.05). The maximum number of leaves plant^{-1} (205.66) was recorded in African Yellow, were as the minimum number of leaves plant^{-1} (118.5) was recorded in African Orange.

Table 6. *Number of Leaves plant^{-1} as Affected by Farmyard Manure.*

	Varieties		
Treatment	African Yellow	African Orange	Mean
Canal Silt	88.33	83.33	83.33b
Canal Silt + FYM (1:1)	328.00	153.67	240.83a
Mean	205.66a	118.5b	
	Growing Media	Varieties	GM x V
S. E±	30.970	30.970	43.799
LSD 0.05	71.418	71.418	101.00
Probability Value	0.0011	0.0221	0.0233
Fisher Value	24.41	8.01	7.83
CV %	32.64		

3.7. Number of Flowers Plant^{-1}

Result pertaining to number of flowers plant^{-1} presented in (Table 7) showed significant effect of Farmyard manure. The maximum number of flowers plant^{-1} (23.16) was recorded in Canal silt + FYM (1:1) were as minimum number of flowers plant^{-1} (9.83) was recorded in only canal silt. Among the varieties, African Yellow and African Orange had statically significant (P<0.05). The maximum number of flowers plant^{-1} (16.83) was recorded in African Yellow, were as the minimum number of flowers plant^{-1} (16.16) was recorded in African Orange.

Table 7. *Number of Flower plant^{-1} as Affected by Farmyard Manure.*

	Varieties		
Treatment	African Yellow	African Orange	Mean
Canal Silt	9.00	10.66	9.83b
Canal Silt + FYM (1:1)	24.66	21.66	23.16a
Mean	16.83a	16.16b	
	Growing Media	Varieties	GM x V
S. E±	2.4495	2.4495	3.4641
LSD 0.05	5.6485	5.6485	7.9882
Probability Value	0.0006	0.7924	0.3687
Fisher Value	29.63	0.07	0.91
CV %	25.71		

3.8. Length of Leaves (cm)

Result pertaining to length of leaves (cm) presented in (Table 8) showed significant effect of Farmyard manure. The maximum length of leaves (2.66cm) was recorded in Canal silt + FYM (1:1) were as minimum length of leaves (1.94cm) was recorded in only canal silt. Among the varieties, African Yellow and African Orange had statically significant (P<0.05). The maximum length of leaves (2.51cm) was recorded in African Yellow, were as the minimum length of leaves (2.09cm) was recorded in African Orange.

Table 8. *Length of Leaves (cm) as Affected by Farmyard Manure.*

	Varieties		
Treatment	African Yellow	African Orange	Mean
Canal Silt	3.16	0.73	1.94b
Canal Silt + FYM (1:1)	1.86	3.46	2.66a
Mean	2.51a	2.09b	
	Growing Media	Varieties	GM x V
S. E±	0.1810	0.1810	0.2560
LSD 0.05	0.4175	0.4175	0.5904
Probability Value	0.0042	0.0504	0.0000
Fisher Value	15.67	5.30	124.08
CV %	13.58		

3.9. Number of Branches Plant^{-1}

Result pertaining to number of branches plant^{-1} presented in (Table 9) showed significant effect of Farmyard manure. The maximum number of branches plant^{-1} (25.33) was recorded in Canal silt + FYM (1:1) were as minimum number of branches plant^{-1} (10.99) was recorded in only canal silt. Among the varieties, African Yellow and African Orange had statically significant (P<0.05). The maximum number of branches plant^{-1} (20.49) was recorded in African Yellow, were as the minimum number of branches plant^{-1} (15.83) was recorded in African Orange.

Table 9. *Number of Branches plant^{-1} as Affected by Farmyard Manure.*

	Varieties		
Treatment	African Yellow	African Orange	Mean
Canal Silt	6.66	15.33	10.99b
Canal Silt + FYM (1:1)	34.33	16.33	25.33a
Mean	20.49a	15.83b	
	Growing Media	Varieties	GM x V
S. E±	2.2423	2.2423	3.1710
LSD 0.05	5.1707	5.1707	7.3125
Probability Value	0.0002	0.0710	0.0003
Fisher Value	40.86	4.33	35.36
CV %	21.38		

4. Discussion

Marigold is a heavy feeder and generally has a longer blooming period [4]. Increase in Farmyard manure levels increased total flower number and inflorescence number [17, 13].

The growth and flower behaviors of marigold cultivars were shown to be significantly impacted ($P<0.05$) by varied farmyard manure. The marigold fertilized with Canal silt + farmyard manure (1:1) resulted in (33.16 cm) plant height, (52.33) leaves plant^{-1}, (51.00) days to flower bud initiation, (23.33) number of flowers plant^{-1}, (13.73 g) weight of single flower, (35.52 mm) diameter of single flower and (59.83) days to flower persistence. The marigold receiving Canal silt + farmyard manure (2:1)) resulted in (31.16 cm) plant height, (50.16) leaves plant^{-1}, (54.83) days to flower bud initiation, (21.50) number of flowers plant^{-1}, (11.58 g) weight of single flower, (33.51 mm) diameter of single flower and (57.00) days to flower persistence. After reviewing the data of this study, it was determined that marigold growth and flowering behaviors showed significant and positive response to farmyard manure ratios, and marigold treated with Canal silt + FYM (1:1) dust produced the longer plants with heavier and more flowers and blooming period as well. The response of varieties used in the study was also pronounced to different farmyard manure ration. The "Inca orange" produced much higher results than the "Bonanza harmony." [15, 5]. found greater height of the plant with the application of FYM in marigold plants. [23] point of view is that due to the gradual release of nutrients for plant absorption, the farmyard manure ratio are found highly beneficial for acceptable yield of crop plants.

5. Conclusion

The summarized results of the data determine that response of farmyard manure had a positive and significant influence on different varieties on the growth and flowering of marigold. However, based on findings the present study was conducted that the growth and flowering of T_2 Canal Silt + Farmyard manure (1:1) better nourished with African yellow variety.

Author Contribution Statement

Ajay Kumar; Methodology, Software Ali Raza Jamali; Validation, Original Draft, Writing, Tanveer Fatima Miano; Supervision, Project administration, Roshal Lal; Formal analysis, Abdul Wahab Soomro; Writing — Review & Editing, Munesh Kumar; Investigation, Resources, Data curation, Shuaib Ahmed Magsi; Visualization, Aneel Kumar; Funding acquisition.

Conflicts of Interest

The authors declare that they have no competing interests.

Ethical Approval and Consent to Participate

The authors declare that they have no known competing financial interests or personal relationships that seem to affect the work reported in this article. We declare that we have no human participants, human data, or human tissues.

Consent for Publication

We do not have any individual person's data in any form.

References

[1] Abiola, I. O., Akoun, J., Aiyelaagbe, I. O. O., Ekpo, Jayeoba, O. J., Adams, B. A., Ogunbanjo, O. A. and Osikabor, B. (2005). Growth response of *Tagetes* (eds.) *Proceedings of the 23th Annual Conference of Horticultural Society of Nigeria (HORTSON).* Rivers State College of Education, Port Harcourt, Nigeria. pp 184 – 186.: 179-183.: 179-183. 9 (1): 652- 657.

[2] Acharya, M. M. and L. K. Dashora (2004). Response of graded levels of nitrogen and phosphorus on vegetative growth and flowering in African marigold. *Journal of Ornamental Horticulture* 7 (2), 25-31.

[3] Ali, E. F. and Hassan, F. A. (2013). Impact of Foliar Application of Commercial Amino Acids Nutrition on the Growth and Flowering of *Tagetes erecta* L. Auge, R. M., 2001. Water relations, drought and vesicular arbuscular mycorrhizal symbiosis. Mycorrhiza 11, 3–42.

[4] Aminifard, M. H., Aroiee, H. Fatemi, H. Ameri, A. &Karimpour, S. (2014). Responses of marigold to different rates of nitrogen under field conditions. *Journal of Agriculture Science*, 11 (4): 453-458.

[5] Barman, D., Datta, M. De, L. C. & Banik, S. (2017). Efficiency of phosphate solubilizing and phytoharmons producing bacteria on the growth and yield tuberose in acid soil of Tripura. *India Journal of Horticulture*, 60 (3): 303-306.

[6] Basu, S. D., Roy, S. K., 1975. Rotylenchulus sp. a new ecto parasitic nematode in ted soil. Two and Bud (22 (1), (17) Em). In: Abst, C. F. H., Tocklia Experimental Station Horhat, Aaaaem, India, vol. 46. Breeding for Resistance to Fungal Pathogens. Canadian Journal of Botany 68, 1039–1044 (1976).

[7] Blondo, R. J. and Noland, D. A. (2000). *Floriculture: From Greenhouse Production to Floral.*

[8] Chauhan, S., Singh, C. N. & Singh, A. K. (2005). Effect of vermicompost and pinching on growth and flowering in marigold cv. Pusa Narangi Gainda. *Progressive Horticulture*. *37* (2), 419-422.

[9] Ekwu, L. G. and Mbah, B. N. (2001a). Vegetative and flowering response of Marigold (*Tagetes erecta* L.) to nitrogen and potassium fertilizer. In: B. N. Mbah and K. P. Baiyeri (eds.) *Proceedings of the 19th Annual Conference of Horticultural Society of Design.* Interstate Publishers, Danville, Illinois. Ćetković, G. S., Sonja, M. Đ., Jasna, M., Čanadanović-Nigerian Agricultural Journal Vol. 52, No. 3 | pg. 199.

[10] Fagbola, O., Osonubi, O., Mulongox, K., Odunfa, S. A., 2001. Effects of drought stress and arbuscular mycorrhiza on the growth of Gliricdia sepium (Jacq). Walp, Leucaenal leucocephala (Lam). De wit. In simulated eroded soil conditions. Mycorrhiza 11, 215-223.

[11] Golestani, M., Dolatkhahi, A. and Kazemi, F. (2013). Effect of planting dates on flowering period of *Calendula officinalis*, *Bellis perennis* and *Viola spp*. *Advanced Crop Science* 3 (8): 563-567.

[12] Hartmann, H. T., Kester, D. E., Davies Jr., F. T. and Geneve, R. L. 2007. *Plant Propagation: principles and practices* (7th ed.). Prentice- Hall Inc., New Delhi. in Vermicompost-Amended Medium. *Journal of Applied Science and Agriculture,* 8 (5): 548-555.

[13] Isaac, O. (1994). *Calendula officinalis* L. The marigold Nigerian Agricultural Journal Vol. 52, No. 3 | pg. 201.

[14] Jyothi1, K., Raja, C. H., Goud, Girwani, A., Kumar, S. T., 2017. Studies on the effect of planting date and level of pinching on growth, flowering and yield on marigold (Tagetus erecta L.) CV; Arka Agni.

[15] Koide, R. T., Landherr, L. L., Besmer, Y. L., Detweiler, D. M., Holcomb, E. J., 1999. Strategies for mycorrhizal inoculation of six annual bedding plant species. HortScience 34, 1217-1220.

[16] Lampkin, N. (2016). In: Organic Farming, *Ipswich, U. K. Press Books*, 701-710.

[17] Litoriya, N. S., Gandhi, K. & Talati, J. G., (2014). Nutritional Composition of Different marigold Varieties. *Indian Journal of Agricultural & Biological Sciences, 27* (1), pp. 91-92.

[18] Rahbarl, M., Omidi, M. and Shahram, S. (2013). Organic Transplant Production of Pot Marigold in Vermicompost-Amended Medium. *Journal of Applied Science and Agriculture,* 8 (5): 548-555.

[19] Sasikumar, K., Baskaran, V., Abirami, K., 2015. Effect of pinching and growth retardants on growth and flowering in African marigold cv. Pusa Narangi Gainda. Journal of Horticultural Sciences, 10 (1), Pp. 109-111.

[20] Shadanpour, F., Mohammadi., T. A. and Hashemi, M. K.(2011). The effect of cow manure vermicompost as the planting medium on the growth of Marigold. *Annals of Biological Research* 2 (6): 109-115.3.

[21] Sunitha, H. M., Hunje, R., Vyakaranahal, B. S., Bablad, H. B., 2007. Effect of pinching and growth regulators on plant growth, flowering and seed yield in African marigold (Tagetus erecta Linn.). Journal of ornamental Horticulture, 10 (2), Pp. 91-95.

[22] Wani, Muneeb, A., Khan, F. U., Nazkil, Tahir, I., Khan, F. A., Khan, Shabir Hussain., Ali, Tahir Neelofar, 2018. Phyto morphology of Callistephus chinensis as influenced by differential planting geometry, pinching, and compound nutrient sprays. Current Journal of Applied Science and Technology, 26 (4), Pp. 1-11.

[23] Yosefi, K., Galavi, M. Ramrodi M, &Mousavi S. R (2016) Effect of bio-phosphate and chemical phosphorus fertilizer accompanied with micronutrient foliar application on growth, yield and yield components of maize (Single Cross 704). *Australian Journal of Cropp Sciences, 5* (2): 175-180.