International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; SP-9(9): 527-532
www.biochemjournal.com
Received: 24-07-2025
Accepted: 30-08-2025

Sheetal S Patel
Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture, Navsari Agricultural University, Gujarat, India

Dipal S Bhatt
Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture, Navsari Agricultural University, Gujarat, India

BM Tandel
Department of Fruit Science, ASPEE College of Horticulture, Navsari Agricultural University, Gujarat, India

SL Chawla
Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture, Navsari Agricultural University, Gujarat, India

ST Bhatt
Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture, Navsari Agricultural University, Gujarat, India

Srushti Pandya
Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture, Navsari Agricultural University, Gujarat, India

Corresponding Author:
Sheetal S Patel
Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture, Navsari Agricultural University, Gujarat, India

Effect of different planting time and stimulants on growth, flowering and yield of chrysanthemum

Sheetal S Patel, Dipal S Bhatt, BM Tandel, SL Chawla, ST Bhatt and Srushti Pandya

DOI: https://www.doi.org/10.33545/26174693.2025.v9.i9Sg.5555

Abstract
An experiment was conducted at Navsari Agricultural University, Navsari and laid out in Split Plot Design with fifteen treatment combinations, consisting of five planting time and three stimulants and replicated by four times. Among different planting time, chrysanthemum planted in third week of August (M_1) recorded highest plant height (43.40 cm), plant spread in N-S and E-W directions (42.10 cm and 40.43 cm, respectively), number of branches per plant (4.17) at 75 days after transplanting. Earliness in 50% flowering (87.08 days) was noted with third week of October planting (M_5). Moreover, maximum number of flowers per plant (124.10), weight of flowers per plant (296.84 g), yield of flowers per plot (6.19 kg) and yield of flowers per ha (24.56 t) were also obtained in August planting. Whereas, in case of foliar application of $FeSO_4$ 0.5% + $ZnSO_4$ 0.5% at 30, 45 and 60 DATP resulted maximum plant height (41.38 cm), plant spread in N-S and E-W directions (35.96 cm and 34.00 cm, respectively), number of branches per plant (3.81). Furthermore, maximum number of flowers per plant (101.50), weight of flowers per plant (255.41 g), yield of flowers per plot (5.40 kg) and yield of flowers per ha (21.44 t) with earliness for 50% flowering (95.15 days) were noted in same treatment.

Keywords: *Dendranthema grandiflora*, planting time, foliar application, $FeSO_4$ + $ZnSO_4$, *Panchgavya*

Introduction
Chrysanthemum (*Dendranthema grandiflora* Tzvelve) is one of the important commercial flower crops for global as well as domestic markets. The word chrysanthemum is derived from the Greek words '*chrysos*' (gold) and '*anthemon'* or *'anthos'* (flower). It belongs to family Asteraceae (Anderson, 1987) [2]. It is native to northern hemisphere chiefly Mediterranean region, China and Asia although many scientists claim that China is the place of origin of chrysanthemum (Bose *et al*., 2002) [5]. Chrysanthemum is suitable for various purposes for flower beds, as cut flowers, as pot plants, as loose flowers, for garland making, hair decoration and for the exhibition. Chrysanthemum is classified as a short day plant that is naturally induced to flowering periods of days less than 14:30 h light and may vary according to the variety and temperature. Difference in planting dates would bring about variation in growth, flowering, yield and quality of chrysanthemum. So, selection of suitable time of planting is necessary to maximize the flower yield with quality flowers in chrysanthemum. The growers can earn more profits by adjusting the proper planting time to produce quality flower and avoid crop flood in the market.
In order to meet the over increasing demand on production of quality flowers, to increase productivity and to overcome the physiological disorders, application of various stimulants are essential. Moreover, in recent decades flower growing practices have been evolving towards organic, sustainable or eco-friendly approaches. The use of stimulants which has the capacity to modify plant growth has widely used over the past decade.
Iron and zinc may prove effective in regulating flowering in crops and aid in better flower production (Pratap *et al*., 2004) [19]. A suitable micronutrient dose, period and method of application can certainly improve the production and quality of flower crops (Gurav *et al*., 2004) [9]. Iron is a key element in different oxidation-reduction reactions of respiration, photosynthesis and of nitrates and sulphates (Reddy and Reddi, 2002) [20]. Studies have revealed the beneficial effect of $FeSO_4$ on chrysanthemum with maximum plant height, early

flowering, number of flowers per plant, flower yield per plant, estimated yield per ha, flowering duration, stem length, flower diameter and post-harvest life of flower (Ganga *et al*., 2008) [8].

Zinc is also an important micronutrient which improves crop productivity and is essential for several enzymatic system that regulate various metabolic activities in plants. Studies have revealed the beneficial effect of $ZnSO_4$ on chrysanthemum with maximum plant height, length of flower stalk, diameter of flower, number of flowers and weight of flower (Barman and Pal, 1990) [4].

Panchagavya, is an organic product which has potential to play great role for promoting growth and providing immunity in plant system. Bio-chemical properties of *panchagavya* revealed that it possesses almost all the major nutrients like N, P, K and essential micro nutrients for plant and growth hormones like IAA and GA required for crop growth (Selvaraj *et al*., 2007) [22].

Materials and Methods

The present experiment was carried out at Floriculture Research Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat during the *Rabi* season of 2020-21 from August to April months. The experiment was laid out in Split Plot Design with fifteen treatment combinations, consisting of five planting time (main plot) i. e., Third week of August (M_1), First week of September (M_2), Third week of September (M_3), First week of October (M_4), Third week of October (M_5) and three stimulants (sub plot) i.e., Control (No spray) (S_0), $FeSO_4$ 0.5% + $ZnSO_4$ 0.5% (S_1), *Panchgavya* 2.0% (S_2).

The experiment was replicated four times. Healthy, disease free, uniform sized, well developed 40 days old terminal rooted plants of chrysanthemum variety 'Bidhan Gold' were transplanted on five different planting times. The cuttings were transplanted with the spacing of 30 x 30 cm to accommodate 28 plants per plot. The transplanting from the nursery to the field was done in the evening hours. Well decomposed farm yard manure (FYM) @ 10 t/ha was added before the transplanting of cuttings and mixed thoroughly in the soil. Nitrogen, phosphorus and potash were applied in the form of urea, single superphosphate and muriate of potash, respectively. Fertilizers were applied at the rate of 150 kg N, 75 kg P and 100 kg K per hectare with half dose of N and full dose of P and K as a basal dose and remaining N at 30 days after transplanting. The observations were recorded on various vegetative, flowering and yield parameters.

Preparation of Stimulants

$FeSO_4$ 0.5% + $ZnSO_4$ 0.5%

The solution was prepared by adding 5 g $FeSO_4$ and 5 g $ZnSO_4$ in one litre of water.

Panchgavya

To prepare 20 litres of *Panchgavya*, 5 kg fresh cow dung and 500 g cow's ghee were mixed thoroughly in a container and kept for three days. This mixture was stirred twice a day. On the 4th day, 3 litre cow's urine, 2 litre cow's milk, 2 litre cow's curd, 3 litre sugarcane juice, 2 litre tender coconut water and 6 meshed ripened banana fruits were mixed thoroughly. This solution was kept for 18 days with stirring twice a day for about 20 minutes to facilitate aerobic microbial activities. On the 19th day, the stock solution of *Panchgavya* was ready to use. The solution was stored in plastic container and covered with a muslin cloth. The required quantity of *Panchgavya* as per the treatments *i.e*.,5 ml and 10 ml were dissolved in water and final volume was made up to 1 litre in volumetric cylinder.

Application of Stimulants

Fresh stimulant solution was prepared at time of each spray and used immediately. First foliar application of stimulants was done 30 days after transplanting of each planting time. Second and third sprays were done at 45 and 60 days after transplanting, respectively as per the treatments with the help of hand sprayer.

Results and Discussion

Effect of planting time on vegetative character of chrysanthemum

The maximum plant height (43.40 cm), plant spread in N-S and E-W (42.10 cm and 40.43 cm, respectively), number of branches per plant (4.17) at 75 days after transplanting was recorded in third week of August (M_1). While minimum plant height (36.30 cm), plant spread (30.48 cm and 26.89 cm) and lowest number of branches per plant (3.05) was observed in third week of October planted plants (M_5).

The increase in plant height, plant spread and number of branches in August planting may be due to long day condition which is favourable for vegetative growth it might better congenial weather conditions during the growth period which promotes more branching. Moreover, due to lower temperature and short day condition in October month which might induced early bud initiation and restrict vegetative growth. These results are in accordance with the findings by Kulkarni and Reddy (2008) [11] in chrysanthemum, Laxmi and Pratap (2011) [12] in chrysanthemum and Sharma *et al*. (2015) [23] in chrysanthemum.

Effect of stimulants application on vegetative character of chrysanthemum

Foliar application of $FeSO_4$ 0.5% + $ZnSO_4$ 0.5% at 30, 45 and 60 DATP resulted maximum plant height (41.38 cm), plant spread in N-S and E-W (35.96 cm and 34.00 cm, respectively), number of branches per plant (3.81) at 75 DAT.

Increased plant height is might be due to synthesis of tryptophan, a precursor of indoleacetic acid (auxin) which is accelerated by zinc and IAA is known to promote apical dominance, maintain polarity and growth. Similarly, iron acts as an important catalyst in the enzymatic reactions of the metabolism and would have helped in larger biosynthesis of photo-assimilates thereby enhancing growth of the plants. It is in conformity with the observations of Saini *et al*. (2015) [21] in chrysanthemum and Chopde *et al*. (2016) [6] in annual chrysanthemum. Moreover, micronutrients activate several enzymes (catalase, peroxidase, alcohol, dehydrogenase, carbonic dehydrogenize, tryptophane synthase etc.) and involved themselves in chlorophyll synthesis and various physiological activities by which plant growth and development are encouraged. These findings are in accordance with the results of Barman and Pal (1993) [3] in chrysanthemum, Naik *et al*. (2019) [14] in jasmine and Alka (2020) [1] in chrysanthemum.

Effect of planting time and stimulants on vegetative character of chrysanthemum

The maximum plant spread in N-S and E-W directions (46.65 cm and 44.82 cm, respectively) and more number of branches (4.63) was noted in third week of August planting with foliar application of $FeSO_4$ 0.5% + $ZnSO_4$ 0.5% (M_1S_1). The interaction effect of planting time and stimulants application on plant height at 75 DATP was found non-significant.

Vigorous growth with respect to maximum plant spread and more branches probably due to favourable weather conditions of long day which results in highest spreading and leads to sufficient biomass of plants. Furthermore, application of stimulants might be more efficient due to vigorous growth, increased photosynthesis and translocation of food material which enhanced the plant spread and ultimately boost the branches.

Effect of planting time on flowering character of chrysanthemum

An early 50% flowering (87.08 days) was noted with third week of October planting (M_5). Maximum weight of 10 flowers (48.11 g) and shelf life of flowers (4.99 days) was observed in third week of August planting (M_1). However, maximum flower diameter (5.80 cm) was obtained from the plants planted in first week of September (M_2).

October planted crop took less time for 50% flowering. It might be due to short day condition in which plant could not get sufficient time to put up requisite vegetative growth and entered early into the reproductive phase. The findings are in conformity with the observation of Meher *et al*. (1999) [13] in chrysanthemum and Poonam *et al*. (2002) [18] in zinnia. Increase in flower size in September planted plants might be due to exposure to most favourable climatic conditions for longer duration which might have resulted in translocation of more photosynthates to the sink, *i.e*. flower and which in turn helped in increased flower size. The results are in accordance with the findings of Sharma *et al*. (2015) [23] in chrysanthemum. Maximum weight of flowers could be attributed to optimum temperature during active growth period which might have higher biomass accumulation and photosynthetic reserves for the source sink relation for flower quality. These results are also in close agreement with the findings of Singh *et al*. (2015) [24] in marigold. Enhanced shelf life of flowers might be due to maximum food reserves and better water in flowers. Deshmane *et al*. (2012) [7] also reported the similar trend for flower longevity in marigold.

Effect of stimulants application on flowering character of chrysanthemum

Maximum flower diameter (5.31 cm), weight of 10 flowers (41.66 g) and earliness for 50% flowering (95.15 days) noted with foliar application of $FeSO_4$ 0.5% + $ZnSO_4$ 0.5% at 30, 45 and 60 DATP. While, Shelf life of flowers showed non-significant effect due to application of stimulants.

Chopde *et al*. (2016) [6] explained that due to application of 0.5% $FeSO_4$ + 0.5% $ZnSO_4$ enhanced vegetative growth is resulted in to production of more food material which in turn might have been utilize for better development of flower of annual chrysanthemum. The association of zinc in regulating semi permeability of cell walls thus mobilizing more water into flowers and also increased the synthesis of iron which promotes cell size in term increase the weight of flowers. Optimum dose of zinc and iron on reducing juvenile phase of the plant. The results are in agreement with Narayana (2015) [15] in marigold and Ganga *et al*. (2008) [8] in chrysanthemum.

Effect of planting time and stimulants on flowering character of chrysanthemum

The interaction effect of planting time and stimulants application on flowering character was found non-significant.

Effect of planting time on yield character of chrysanthemum

Maximum number of flowers per plant (124.10), weight of flowers per plant (296.84 g), yield of flowers per plot (6.19 kg) and yield of flowers per ha (24.56 t) were noted in third week of August planting (M_1).

This might be due to prevalence of congenial atmospheric condition with moderate temperature during August planting coupled with favourable effect of planting time in increasing number and weight of flower per plant ultimately leads to higher yield per plot and per ha. Similar results were also obtained by Meher *et al*. (1999) [13] and Sharma *et al*. (2015) [23] in chrysanthemum.

Effect of stimulants application on yield character of chrysanthemum

Maximum number of flowers per plant (101.50), weight of flowers per plant (255.41 g), yield of flowers per plot (5.40 kg) and yield of flowers per ha (21.44 t) were recorded with foliar application of $FeSO_4$ 0.5% + $ZnSO_4$ 0.5% at 30, 45 and 60 DATP.

Application of iron and zinc relieved the plants from chlorosis and produced healthy green leaves which resulted in higher assimilate synthesis and partitioning of the flower growth which may in turn increase the flower production and ultimately flower yield. Similar results were also obtained by Karuppaiah (2014) [10] in chrysanthemum, Pal *et al*. (2016) [16] in Gerbera and Alka (2020) [1] in chrysanthemum.

Effect of planting time and stimulants on yield character of chrysanthemum

Plant transplanted in third week of August along with foliar application of $FeSO_4$ 0.5% + $ZnSO_4$ 0.5% (M_1S_1) at 30, 45 and 60 DATP resulted maximum number of flowers per plant (140.15), weight of flowers per plant (324.62 g), yield of flowers per plot (6.77 kg) and yield of flowers per ha (26.87 t).

Early grown plants having more vegetative growth due to optimum climatic conditions, which favours maximum photosynthesis and increased synthesis of micronutrients hence, promote the quality and number of flowers and ultimately increased weight of flowers per plant and yield of flowers per plot and per ha.

Table 1: Effect of planting time and stimulants on vegetative character of chrysanthemum

Treatments	Plant height (cm)	Plant spread (cm) N-S	Plant spread (cm) E-W	Number of branches
Planting time (M)				
M_1	43.40	42.10	40.43	4.17
M_2	42.65	34.75	33.21	3.84
M_3	41.10	33.36	31.93	3.71
M_4	37.74	31.71	29.35	3.74
M_5	36.30	30.48	26.89	3.05
S. Em.±	1.34	1.11	0.92	0.13
C. D. at 5%	4.12	3.42	2.83	0.39
Stimulants (S)				
S_0	38.65	32.33	30.59	3.52
S_1	41.38	35.96	34.00	3.81
S_2	40.68	35.15	32.49	3.78
S. Em.±	0.78	0.82	0.83	0.08
C. D. at 5%	2.24	2.37	2.41	0.23
Interaction (M x S)				
M_1S_0	42.36	38.27	36.05	3.63
M_1S_1	44.54	46.65	44.82	4.63
M_1S_2	43.31	41.40	40.42	4.25
M_2S_0	41.07	34.44	35.35	4.08
M_2S_1	43.54	36.71	30.92	3.73
M_2S_2	43.35	33.09	33.36	3.73
M_3S_0	39.21	28.03	29.24	3.43
M_3S_1	42.51	36.72	34.27	3.80
M_3S_2	41.58	35.33	32.29	3.90
M_4S_0	35.25	31.20	27.99	3.53
M_4S_1	39.28	29.92	33.02	3.93
M_4S_2	38.68	34.03	27.06	3.78
M_5S_0	35.38	29.72	24.34	2.93
M_5S_1	37.04	29.80	27.00	2.98
M_5S_2	36.50	31.91	29.32	3.26
S. Em.±	1.73	1.83	1.86	0.18
C. D. at 5%	NS	5.30	5.38	0.52

Table 2: Effect of planting time and stimulants on flowering character of chrysanthemum

Treatments	Days taken to 50% flowering	Flower diameter (cm)	Weight of 10 Flowers (g)	Shelf life (days)
Planting time (M)				
M_1	105.58	5.49	48.11	4.99
M_2	103.67	5.80	39.23	4.05
M_3	101.17	5.03	38.85	4.04
M_4	93.67	4.54	36.59	3.97
M_5	87.08	4.91	36.50	3.98
S. Em.±	2.53	0.14	1.31	0.13
C. D. at 5%	7.79	0.44	4.02	0.41
Stimulants (S)				
S_0	101.35	4.98	37.97	3.98
S_1	95.15	5.31	41.66	4.33
S_2	98.20	5.17	39.94	4.31
S. Em.±	1.33	0.09	0.80	0.11
C. D. at 5%	3.83	0.26	2.30	NS
Interaction (M x S)				
M_1S_0	103.00	5.38	49.61	5.15
M_1S_1	106.50	5.68	48.12	4.83
M_1S_2	107.25	5.40	46.61	5.00
M_2S_0	109.00	5.67	37.63	3.25
M_2S_1	94.50	5.91	40.22	4.48
M_2S_2	107.50	5.83	39.85	4.43
M_3S_0	101.75	5.11	36.77	4.15
M_3S_1	100.00	5.26	42.18	4.20
M_3S_2	101.75	4.71	37.59	3.78
M_4S_0	98.75	4.31	30.88	3.78
M_4S_1	91.25	4.50	40.48	4.10
M_4S_2	91.00	4.81	38.43	4.03
M_5S_0	94.25	4.42	34.98	3.58
M_5S_1	83.50	5.23	37.32	4.03
M_5S_2	83.50	5.09	37.22	4.33
S. Em.±	2.97	0.20	1.78	0.25
C. D. at 5%	NS			

Table 3: Effect of planting time and stimulants on yield character of chrysanthemum

Treatments	Number of flowers per plant	Weight of flowers per plot (g)	Yield of flowers per plot (kg)	Yield of flowers per ha (t)
Planting time (M)				
M_1	124.10	296.84	6.19	24.56
M_2	97.48	258.17	5.71	22.66
M_3	91.19	253.37	5.28	20.96
M_4	90.16	209.67	4.41	17.51
M_5	84.94	205.18	4.28	16.99
S. Em.±	3.37	8.44	0.17	0.69
C. D. at 5%	10.38	26.00	0.54	2.13
Stimulants (S)				
S_0	91.26	229.96	4.85	19.25
S_1	101.50	255.41	5.40	21.44
S_2	99.96	248.56	5.27	20.91
S. Em.±	2.40	6.08	0.13	0.50
C. D. at 5%	6.94	17.57	037	1.45
Interaction (M x S)				
M_1S_0	106.71	249.80	5.83	23.15
M_1S_1	140.15	324.62	6.77	26.87
M_1S_2	125.44	316.09	5.97	23.67
M_2S_0	101.72	260.20	5.94	23.57
M_2S_1	86.60	270.84	5.45	21.62
M_2S_2	104.14	243.47	5.74	22.78
M_3S_0	83.25	258.26	4.26	16.91
M_3S_1	99.13	255.39	5.91	23.47
M_3S_2	91.19	246.45	5.68	22.52
M_4S_0	89.11	204.92	4.31	17.11
M_4S_1	92.39	211.21	4.36	17.31
M_4S_2	88.97	212.88	4.56	18.10
M_5S_0	75.54	176.63	3.91	15.53
M_5S_1	89.23	215.00	4.52	17.95
M_5S_2	90.06	223.91	4.41	17.50
S. Em.±	5.38	13.60	0.28	1.12
C. D. at 5%	15.52	39.28	0.82	3.24

Conclusion

From the result of the foregoing discussion, it can be concluded that chrysanthemum var. Bidhan Gold planted in third week of August along with the application of $FeSO_4$ 0.5% + $ZnSO_4$ 0.5% at 30, 45 and 60 DATP enhanced vigorous growth with highest yield of the flowers.

Acknowledgement

The authors are grateful to the ASPEE College of Horticulture, Navsari Agricultural University, Navsari, Gujarat for technical assistance.

References

1. Alka. Effect of various stimulants on growth, flower quality and yield of chrysanthemum [MSc thesis]. Navsari: Navsari Agricultural University; 2020. 82 p.
2. Anderson RL. Reclassification of genus *Chrysanthemum*. HortScience. 1987;22:313.
3. Barman D, Ghosh S, Pal P. Effect of planting date and pinching height on cut flowering of chrysanthemum (*Chrysanthemum morifolium* Ramat.) cv. Chandrama. Hortic J. 1993;6(2):121-124.
4. Barman D, Pal P. Effect of micronutrients on growth and flowering of *Chrysanthemum morifolium* cv. Chandrama. Haryana J Hort Sci. 1990;28(1):78-79.
5. Bose TK, Yadav LP, Pal P. Commercial floriculture. 2nd ed. Kolkata: Naya Prokash; 2002. p. 463-602.
6. Chopde N, Borse GH, Kuchanwar O, Ghodke AT. Effect of zinc sulphate and ferrous sulphate on growth and flowering of annual chrysanthemum. Plant Arch. 2016;16(2):594-596.
7. Deshmane S, Khirtikar SD, Panchbhai DM, Prarthana J, Pakhale S, Tayade BB. Effect of planting time and spacing on quality and yield of French marigold. J Soils Crops. 2012;22(1):172-176.
8. Ganga M, Jegadeeswari V, Padmadevi K, Jawaharlal M. Response of chrysanthemum cv. Co-1 to the application of micronutrients. J Ornam Hort. 2008;11(3):220-223.
9. Gurav SB, Katwate M, Singh BR, Sabale RN, Kakade DS, Dhane AV. Effect of nutritional levels on yield and quality of gerbera. J Ornam Hort. 2004;7(3-4):226-229.
10. Karuppaiah P. Effect of zinc and iron on growth, yield and quality of chrysanthemum (*Dendranthema grandiflorum* Tzvelv.). Asian J Hort. 2014;9(1):232-236.
11. Kulkarni BS, Reddy BS. Effect of different dates of planting on growth and flowering of chrysanthemum (*Chrysanthemum morifolium* Ramat.). J Ornam Hort. 2008;11(3):177-180.
12. Laxmi P, Pratap M. Effect of dates of planting on growth, flowering and yield of different chrysanthemum (*Dendranthema grandiflora* L.) cultivars. Res Crops. 2011;12(3):813-816.
13. Meher SP, Jiotode DJ, Turkhede AB, Darange SO, Ghatol PU, Dhawad CS. Effect of planting time and growth regulator treatments on flowering yield of chrysanthemum (*Chrysanthemum morifolium* Ramat.). Crop Res (Hisar). 1999;18(3):345-348.
14. Naik B, Bhatt ST, Bhatt DS, Patel GD, Gaikwad SS, Gamit D. Effect of different stimulants on off-season

flowering in *Jasminum sambac* L. Int J Chem Stud. 2019;7(2):2022-2026.
15. Narayan S. Effect of foliar application of NAA and microelements on vigour and flowering of marigold (*Tagetes erecta* L.) cv. Pusa Basanti. HortFlora Res Spectrum. 2015;4(3):264-267.
16. Pal S, Barad AV, Singh AK, Khadda BS, Daleep K. Effect of foliar application of Fe and Zn on growth, flowering and yield of gerbera (*Gerbera jamesonii*) under protected condition. Indian J Agric Sci. 2016;86(3):394-398.
17. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. New Delhi: ICAR; 1985. 369 p.
18. Poonam KR, Dubey RK. Effect of planting time and spacing on zinnia. J Ornam Hort. 2002;5(2):51-52.
19. Pratap M, Amarender R, Reddy YN. Effect of foliar application of $FeSO_4$ and $ZnSO_4$ on flower production and anthocyanin content of gladiolus spike. J Ornam Hort. 2004;7(2):159-163.
20. Reddy TY, Reddi GHS. Principles of agronomy. 3rd ed. India: Kalyani Publishers; 2002. 526 p.
21. Saini TC, Polara ND, Barad AV. Effect of micronutrients (Fe and Zn) on growth of chrysanthemum (*Chrysanthemum morifolium* Ramat.). Asian J Hort. 2015;10(2):216-221.
22. Selvaraj J, Ramaraj B, Devarajan K, Seenivasan N, Senthilkumar S, Sakthi E. Effect of organic farming on growth and yield of thyme. In: National Seminar on Production and Utilization of Medicinal Plants; 2007 Jan 13-14; Annamalai, India. p. 13-14.
23. Sharma P, Gupta YC, Dhiman SR, Sharma P, Gupta R. Effect of planting dates on growth, flowering and seed production of garland chrysanthemum (*Chrysanthemum coronarium*). Indian J Agric Sci. 2015;85(7):912.
24. Singh AK, Kumar U, Kumar A. Effect of planting date and spacing on performance of marigold (*Tagetes erecta* Linn.) cv. Pusa Narangi under North Bihar agro-ecological conditions. Int J Forestry Crop Improv. 2015;6(1):16-20.