Chemical Science Review and Letters ISSN 2278-6783

Research Article

African marigold is Response to foliar application of Zinc and Salicylic acid

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Abstract

A field experiment on African marigold (*Targets erecta*L.) was conducted during winter season of 2014-15to study the foliar effect of Zn and SA of 20 treatment combinations having five concentrations of zinc (0.0, 0.25, 0.50, 0.75, and 1.0 %) and salicylic acid (0.0, 0.25, 0.50 and 1.0 mM/L).The treatmentZn_4SA_3 (Zinc 1% + Salicylic acid 1.0 mM/L) recorded the main stem diameter (1.50 cm), number of primary branches per plant (11.27), maximum diameter of tap root (1.35 cm), longest duration of flowering (61.85 days), (39.78 days) and 50 % flowering (59.73 days) while, the minimum recorded in control. Application of zinc and salicylic acid at different levels significantly influenced the maximum main stem diameter (1.41 cm), number of primary branches per plant (10.13), diameter of tap root (1.31 cm), days taken for 50 % flowering (61.85 days) and duration of flowering (59.84 days) at Zn_4 (Zinc 1.0%). Similarly, among the SA, SA_3 (Salicylic acid 1.0 mM/L) had the main stem diameter (1.39 cm), number of primary branches per plant (9.95), diameter of tap root (1.25 cm), days taken for 50 % flowering (61.46 days) and duration of flowering (58.31 days).

Keywords: African marigold, Zinc, Salicylic acid, PusaNarangiGainda

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Introduction

African marigold *(Tageteserecta*L.) belong to family Asteracece is a very popular commercial flower crop as loose flower in India because of its wide adaptability to variou soils and climatic conditions, easy cultivation, profuse flowering habit, short duration to produce marketable flowers and good keeping quality. It is established fact that nutrition plays an important role in the improvement of growth and yield in marigold. Zinc is essential micronutrient and also activator of enzymes like dehydrogenases, proteinases and peptidases.The role of Zinc in plant is due to its requirement in the synthesis of tryptophan which is a precursor of indole acetic acid [1] and also activates the plant defense mechanism [2].

Salicylic acid (SA) is a phenolic compound, which plays an important role in regulation of plant growth and development, fruit yield, flowering and physiological processes and synthesis of auxins and cytokinins [3]. It also regulates a number of processes in plants including disease resistance, seed germination, sex polarization and ethylene production [4].

Foliar application constitute the most effective means of micro-nutrient application when problems of nutrient fixation in the soil are exists. Therefore keeping this in view, the present experiment was initiated with an objective to study the effect of Zn and SA on growth and flowering of African marigold cv. PusaNarangiGainda to work out optimum dose of Zn and SA.

Materials and Methods

The field experiment was carried out at the Instructional Farm, KrishiVigyan Kendra, Jhalawar, during rabi season 2014-15. The soil had organic carbon 0.48 %, available nitrogen 240.68 kg/ha, available phosphorus 16.83 kg/ha and available potash 299.0 kg/ha. One month-old seedlings of cv. PusaNarangiGainda were transplanted at the spacing of

30 x 30 cm by drip irrigation in RBD factorial design. The observations on number of primary branches, main stem diameter, diameter of tap root, duration of flowering, days taken for first flower bud appearance and days taken for 50 % flowering were recorded (5,6)

RESULTS and DISCUSSION

Vegetative parameters

The growth characters differed significantly for the various zinc, salicylic acid levels and interactions of Zn x SA (**Table 1**). The main stem diameter (1.41 cm), number of primary branches per plant (10.13) and diameter of tap root (1.31 cm) were recorded with Zn_4while the main stem diameter (1.22 cm), number of primary branches per plant (7.96) and diameter of tap root (1.11 cm) were recorded with Zn_0.The main stem diameter (1.39 cm), number of primary branches per plant (9.95) and diameter of tap root (1.25 cm) were recorded with SA_3.The main stem diameter (1.23 cm), number of primary branches per plant (8.95) and diameter of tap root (1.14 cm) were recorded with SA_0.The main stem diameter (1.50 cm), number of primary branches per plant (11.27) and diameter of tap root (1.35 cm) were recorded with Zn_4SA_3 while, the main stem diameter (1.10 cm), number of primary branches per plant (6.60) and diameter of tap root (1.05 cm) were recorded with control.

Table 1 Effect of Zinc and Salicylic acid on reproductive, growth and root of marigold

Treatment	Days taken for 50% flowering (DAT)	Main stem Diameter (cm)	Number of primary branches per plant	Duration of flowering	Diameter of tap root (cm)
Zinc					
Zn_0	66.70	1.22	7.96	53.67	1.11
Zn_1	63.37	1.27	8.84	55.26	1.14
Zn_2	63.54	1.30	9.89	56.51	1.17
Zn_3	63.23	1.35	10.36	58.72	1.22
Zn_4	61.85	1.41	10.93	59.85	1.31
CD at 5%	0.76	0.05	0.46	1.45	0.03
Salicylic acid					
SA_0	64.70	1.23	8.95	55.49	1.14
SA_1	64.32	1.29	9.58	56.46	1.17
SA_2	63.27	1.32	9.75	56.95	1.20
SA_3	61.46	1.39	9.95	58.31	1.25
CD at 5%	0.68	0.05	0.39	1.30	0.03
Interaction					
Zn_0SA_0	71.01	1.10	6.60	51.68	1.05
Zn_0SA_1	67.66	1.23	7.98	53.88	1.07
Zn_0SA_2	66.08	1.25	8.04	54.33	1.12
Zn_0SA_3	62.06	1.29	9.20	54.78	1.19
Zn_1SA_0	64.67	1.22	8.27	54.45	1.10
Zn_1SA_1	64.47	1.24	8.78	55.12	1.11
Zn_1SA_2	62.60	1.29	9.07	55.34	1.15
Zn_1SA_3	61.78	1.33	9.25	56.14	1.20
Zn_2SA_0	64.67	1.23	9.52	55.08	1.13
Zn_2SA_1	64.40	1.26	9.83	55.98	1.15
Zn_2SA_2	62.90	1.30	10.07	56.98	1.16
Zn_2SA_3	61.76	1.40	10.13	57.98	1.22

Zn_3SA_0	63.47	1.27	9.88	57.46	1.15
Zn_3SA_1	63.08	1.34	10.36	57.96	1.20
Zn_3SA_2	62.60	1.36	10.54	58.67	1.23
Zn_3SA_3	61.15	1.44	10.64	60.78	1.29
Zn_4SA_0	62.98	1.33	10.48	58.78	1.27
Zn_4SA_1	61.41	1.39	10.95	59.35	1.30
Zn_4SA_2	60.95	1.42	11.04	59.43	1.32
Zn_4SA_3	59.73	1.50	11.27	61.85	1.35
CD at 5%	1.53	NS	0.88	2.90	NS

The increase in the growth characters with zinc and salicylic acid 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 [7].The salicylic acid could be attributed to its bio regulator effects on physiological and biochemical processes in plant and increased the number of nodes in plant [8]. The present results are in conformity with the results of [9] in gladiolus [10] in African marigold, [11] in marigold, [12] in gladiolus. The optimum concentration of zinc and salicylic acid may be 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 in stem diameter of plant [13] and protein synthesis which ultimately enhanced the vegetative growth parameter. The results are in agreement with[14] in Occimum.

Floral parameters

The flower characters differed significantly for the various zinc, salicylic acid levels and interactions of Zn x SA (**Table 1**).The days taken for 50 % flowering (61.85 days)and maximum duration of flowering (59.84) were observed at Zn_4 whereas, maximum days taken for days taken for 50 % flowering (63.25 days) and minimum duration of flowering (53.67 days) were observed at Zn_0.The days taken for 50 % flowering (61.46 days) longest duration of flowering (58.31) were observed at SA_3 whereas maximum days taken for first flower bud appearance (43.95) and days taken for 50 % flowering (64.70) and minimum duration of flowering (55.49 days) were observed at SA_0.The interaction effects of zinc and salicylic acid levels showed significant differences on flowering characters. The 50 % flowering (59.73 days)and longest duration of flowering (61.85 days) were recorded with $Zn_4SA_3$and 50 % flowering (71.01 days) and shortest duration of flowering (51.68 days) were recorded with control. Significant differences were also noted with application of different levels of zinc, salicylic acid and their interaction.

The higher levels of zinc and salicylic acid doses promoted reproductive phase resulting in lesser time required for 50 % flowering and also act as regulator at flowering time that interacts with both the photoperiod-dependent and autonomous pathways [15].Maximum duration of flowering might be due the application of salicylic acid and zinc is effective on a wide range of physiological processes and showed synergetic effect with auxin and gibberellins [16]. Similar results are also reported by[17] in gladiolus and [18] in gerbera and (10,20) in marigold.

Conclusion

It is postulated that the foliar spraying with zinc 1.0% + salicylic acid 1.0 mM/L may positively regulated the marigold growth and thus improved the production.

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Publication History
Received 17th Jan 2017
Revised 10th Feb 2017
Accepted 11th Feb 2017
Online 28th Feb 2017