Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(2): 902-904
Received: 25-01-2018
Accepted: 26-02-2018

Vani Onkareppa Sangolli
Department of Crop Physiology, University of Agricultural Sciences, Dharwad, Karnataka, India

CM Nawalagatti
Department of Crop Physiology, University of Agricultural Sciences, Dharwad, Karnataka, India

DS Uppar
Department of Crop Physiology, University of Agricultural Sciences, Dharwad, Karnataka, India

RV Koti
Department of Crop Physiology, University of Agricultural Sciences, Dharwad, Karnataka, India

VB Kuligod
Department of Crop Physiology, University of Agricultural Sciences, Dharwad, Karnataka, India

MP Potadar
Department of Crop Physiology, University of Agricultural Sciences, Dharwad, Karnataka, India

Correspondence
Vani Onkareppa Sangolli
Department of Crop Physiology, University of Agricultural Sciences, Dharwad, Karnataka, India

Effect of zinc nutrition on morphological characters in chickpea

Vani Onkareppa Sangolli, CM Nawalagatti, DS Uppar, RV Koti, VB Kuligod and MP Potadar

Abstract
Present investigation was under taken in order to know the effect of zinc nutrition on morphological characters in chickpea. Among all the treatments significant increase in plant height, number of branches at different growth stages and days to 50% flowering was due to soil application of $ZnSO_4$ @ 10 kg ha^{-1} + foliar application of $ZnSO_4$ @ 0.5% as compared to control.

Keywords: zinc nutrition, plant height, number of branches, days to 50% flowering, chickpea

Introduction
Chickpea (*Cicer arietinum* L.) is the third most important pulse crop. It is an important ancient pulse crop being traditionally grown during *Rabi* in India. Chickpea forms an important source of dietary protein for the human beings, more so for a large vegetarian population. On an average, it produces 126 kg protein per hectare and it is probably the highest protein yielding legume next to soybean. The increasing use of NPK fertilizers, generally devoid of micronutrients, has no doubt increased the food production, but it brought most of problems related to micronutrient deficiencies. Micronutrients are essential for the normal growth of plants. Zinc is one of the 17 essential nutrients that plants need for growth and reproduction. Though zinc is a micronutrient and is required in smaller amounts, it is essential. It is known to have an important role either as a metal component of enzymes or as a functional, structural or regulatory co-factor of a large number of enzymes (Grotz and Guerinot, 2006).

Materials and methods
The experiment was conducted at the Main Agricultural Research Station (MARS), University of Agricultural Sciences, Dharwad (Karnataka). Seeds of Cv. BGD-103 were used for sowing. The experiment was laid-out in randomized block design with nine treatments and three replication *viz.* T_1 - Soil application of $ZnSO_4$ @ 10 kg per ha, T_2 - Soil application of $ZnSO_4$ @ 15 kg per ha, T_3 - Foliar application of $ZnSO_4$ @ 0.5 percent at 45 DAS, T_4 - Foliar application of $ZnSO_4$ @ 1.0 percent at 45 DAS T_5 - Soil application of $ZnSO_4$ @ 10 kg per ha + Foliar application of $ZnSO_4$ @ 0.5 percent at 45 DAS, T_6 - Soil application of $ZnSO_4$ @ 10 kg per ha + Foliar application of $ZnSO_4$ @ 1.0 percent at 45 DAS, T_7 - Soil application of $ZnSO_4$ @ 15 kg per ha + Foliar application of $ZnSO_4$ @ 0.5 percent at 45 DAS, T_8 - Soil application of $ZnSO_4$ @ 15 kg per ha + Foliar application of $ZnSO_4$ @ 1.0 percent at 45 DAS, T_9 – Control.

Results
The present study on zinc nutrition at different stages (30, 60 DAS and at harvest) of crop growth revealed that the plant height was increased with advancement of crop growth. (Table. 1) The plant height at 30 DAS was significantly influenced by zinc nutrition. Among the treatments, T_5 (soil application of $ZnSO_4$ @ 10 kg ha^{-1} + foliar application of $ZnSO_4$ @ 0.5%) recorded the highest plant height (18.53 cm) which was on par with the treatments *viz.*, T_7 (soil application of $ZnSO_4$ @ 15 kg ha^{-1} + foliar application of $ZnSO_4$ @ 0.5%) and T_6 (soil application of $ZnSO_4$ @ 10 kg ha^{-1} + foliar application of $ZnSO_4$ @ 1.0%) (18.45 and 18.15 cm respectively). Whereas, the lowest plant height (16.47cm) was recorded in treatment T_9 (control).
At 60 DAS plant height was found to be highest (38.24 cm) with treatment T_5 (soil application of $ZnSO_4$ @ 10 kg ha^{-1} + foliar application of $ZnSO_4$ @ 0.5%) and it was found to be on par with soil application of $ZnSO_4$ @ 15 kg per ha + foliar application of $ZnSO_4$ @ 0.5 percent treatment (36.30 cm) and soil application of $ZnSO_4$ @ 10 kg per ha + foliar application of $ZnSO_4$ @1.0 percent treatment (35.58 cm), followed by treatments such as T_8 (soil application of

$ZnSO_4$ @ 15 kg/ha + foliar application of $ZnSO_4$ @ 1.0 percent) with height of 35.33 cm and T_3 (foliar application of $ZnSO_4$ @ 0.5%) with height of 35.26 cm. The least plant height (32.95 cm) was recorded in control.

Soil application of $ZnSO_4$ @ 10 kg per ha + foliar application of $ZnSO_4$ @ 0.5 percent recorded highest plant height (40.85cm) even at harvest. It was on par with other treatments like T_7, T_6 and T_8 which recorded plant height of 39.20, 38.67 and 38.10 cm respectively. But it was followed by treatment of $ZnSO_4$ @ 0.5 percent (37.93 cm). The lowest (35.28 cm) plant height was noticed in control.

Number of branches were significantly influenced by zinc nutrition at different growth stages. At 30 DAS, treatment T_5 (soil application of $ZnSO_4$ @ 10 kg ha^{-1} + foliar application of $ZnSO_4$ @ 0.5%) recorded the highest number of branches (3.80) and it was on par with T_7 (soil application of $ZnSO_4$ @ 15 kg ha^{-1} + foliar application of $ZnSO_4$ @ 0.5%) (3.67) followed by T_1 (soil application of $ZnSO_4$ @ 10 kg ha^{-1}) and T_4 (foliar application of $ZnSO_4$ @ 1.0%) (3.13 and 2.87 respectively). Whereas, the lowest number of branches (2.73) were recorded with treatment T_9 (control).

At 60 DAS, higher number of branches (7.33) were recorded in treatment T_5 (soil application of $ZnSO_4$ @ 10 kg ha^{-1} + foliar application of $ZnSO_4$ @ 0.5%). Treatments T_7 (soil application of $ZnSO_4$ @ 15 kg ha^{-1} + foliar application of $ZnSO_4$ @ 0.5 percent and T_6 (soil application of $ZnSO_4$ @ 10 kg ha^{-1} + foliar application of $ZnSO_4$ @ 1.0 percent) were on par with each other registering a number of branches, 6.87 and 6.53 respectively. Followed by foliar application of $ZnSO_4$ @ 1.0 percent (5.87) and T_9 (control) resulted with least number of branches (5.27) and were significantly differed with each other.

The higher number of branches (10.27) were observed in a treatment T_5 (soil application of $ZnSO_4$ @ 10 kg ha^{-1} + foliar application of $ZnSO_4$ @ 0.5%). Whereas, other treatments *viz.,* T_4 (Foliar application of $ZnSO_4$ @ 1.0%) and T_2 (soil application of $ZnSO_4$ @ 15 kg ha^{-1}) were on par with each other giving branches of 8.47 and 8.40 respectively. The control having lowest number of branches (7.53).

Zinc nutrition had significant influence with respect to days to 50 percent flowering (Table 3). Higher number of days to 50 percent flowering (42.33) was recorded in control as compared to other treatments and it was on par with soil application of $ZnSO_4$ @ 15 kg per ha (41.67) and it was followed by (39.67) foliar application of $ZnSO_4$ @ 0.5 percent. But lesser number of days to 50 percent flowering was (37.93) recorded with soil application of $ZnSO_4$ @ 10 kg per ha + foliar application of $ZnSO_4$ @ 0.5 percent

Table 1; Influence of zinc nutrition on plant height (cm) at different growth stages in chickpea

Treatments	Days after sowing		
	30	60	Harvest
T_1 - Soil application of $ZnSO_4$ @ 10 kg ha^{-1}	17.16	34.67	37.24
T_2 - Soil application of $ZnSO_4$ @ 15 kg ha^{-1}	16.98	33.96	37.17
T_3 - Foliar application of $ZnSO_4$ @ 0.5%	17.54	35.26	37.93
T_4 - Foliar application of $ZnSO_4$ @ 1.0%	16.99	34.62	37.20
T_5 - Soil application of $ZnSO_4$ @ 10 kg ha^{-1} + Foliar application of $ZnSO_4$ @ 0.5%	18.53	38.24	40.85
T_6 - Soil application of $ZnSO_4$ @ 10 kg ha^{-1} + Foliar application of $ZnSO_4$ @ 1.0%	18.15	35.58	38.67
T_7 - Soil application of $ZnSO_4$ @ 15 kg ha^{-1} + Foliar application of $ZnSO_4$ @ 0.5%	18.45	36.30	39.20
T_8 - Soil application of $ZnSO_4$ @ 15 kg ha^{-1} + Foliar application of $ZnSO_4$ @ 1.0%	17.87	35.33	38.10
T_9 - Control	16.47	32.95	35.28
Mean	17.57	35.25	37.96
S.Em ±	0.45	0.93	0.96
CD at 5%	1.33	2.78	2.86

Table 2: Influence of zinc nutrition on number of branches at different growth stages in chickpea

Treatments	Days after sowing		
	30	60	Harvest
T_1 - Soil application of $ZnSO_4$ @ 10 kg ha^{-1}	3.13	6.27	9.00
T_2 - Soil application of $ZnSO_4$ @ 15 kg ha^{-1}	2.73	5.60	8.40
T_3 - Foliar application of $ZnSO_4$ @ 0.5%	3.20	6.47	9.07
T_4 - Foliar application of $ZnSO_4$ @ 1.0%	2.87	5.87	8.47
T_5 - Soil application of $ZnSO_4$ @ 10 kg ha^{-1} + Foliar application of $ZnSO_4$ @ 0.5%	3.80	7.33	10.27
T_6 - Soil application of $ZnSO_4$ @ 10 kg ha^{-1} + Foliar application of $ZnSO_4$ @ 1.0%	3.33	6.53	9.33
T_7 - Soil application of $ZnSO_4$ @ 15 kg ha^{-1} + Foliar application of $ZnSO_4$ @ 0.5%	3.67	6.87	9.53
T_8 - Soil application of $ZnSO_4$ @ 15 kg ha^{-1} + Foliar application of $ZnSO_4$ @ 1.0%	3.27	6.47	9.13
T_9 - Control	2.73	5.27	7.53
Mean	3.19	6.30	8.97
S.Em ±	0.22	0.38	0.45
CD (P=0.05)	0.66	1.13	1.35

Table 3: Influence of zinc nutrition on days to 50% flowering in chickpea

Treatments	Days To 50% Flowering
T_1 - Soil application of $ZnSO_4$ @ 10 kg ha^{-1}	40.97
T_2 - Soil application of $ZnSO_4$ @ 15 kg ha^{-1}	41.67
T_3 - Foliar application of $ZnSO_4$ @ 0.5%	39.67
T_4 - Foliar application of $ZnSO_4$ @ 1.0%	41.40
T_5 - Soil application of $ZnSO_4$ @ 10 kg ha^{-1} + Foliar application of $ZnSO_4$ @ 0.5%	37.93
T_6 - Soil application of $ZnSO_4$ @ 10 kg ha^{-1} + Foliar application of $ZnSO_4$ @ 1.0%	39.17
T_7 - Soil application of $ZnSO_4$ @ 15 kg ha^{-1} + Foliar application of $ZnSO_4$ @ 0.5%	38.63

T_8 - Soil application of $ZnSO_4$ @ 15 kg ha^{-1} + Foliar application of $ZnSO_4$ @ 1.0%	39.33
T_9 - Control	42.33
Mean	40.12
S.Em ±	0.84
CD (P=0.05)	2.50

Discussion

The levels of zinc nutrition treatments significantly influenced the morphological characters *viz.*, plant height, number of branches and days to 50 percent flowering. Basically, all these are genetically controlled characters, but several studies have indicated that these can be increased or decreased by different levels of zinc nutrition.

Results showed significant differences with respect to plant height and number of branches as influenced by zinc nutrition at 30, 60 DAS and at harvest. It was interesting to note that there was increase in the plant height and number of branches over control. The same trend was maintained at 60 DAS and at harvest. Highest plant height (18.53, 38.24 and 40.85 cm) and number of branches (3.80, 7.33 and 10.27) were found with the treatment having soil application of $ZnSO_4$ @ 10 kg per ha + foliar application of $ZnSO_4$ @ 0.5 percent at the interval of as compared to control. Verma *et al*. (2004) reported that foliar spray of 0.5 percent $ZnSO_4$ proved effective and recorded significantly higher plant height and number of branches over the control in pigeonpea. The results are in conformity with Mokhartr *et al.* 2013, their results revealed that application of $ZnSO_4$ @ 0, 10 and 20 kg $ZnSO_4$ per ha had significant effect on plant height, number of pods per plants, 100 seed weight seed yield in lentil crop.

This increment in plant height and number of branches may be due to effect of zinc which is involved in IAA synthesis and also metabolic process in plants (Verma *et al*., 2004). Reasonable increase in plant height, might be increased due to zinc spray which caused increase in the production of tryptophan as precursor of auxin (IAA) which is responsible for the stem growth in gerbera (Khosa *et al*., 2011).

Different environmental factors such as light and temperature show predictable and repeatable pattern of variation during the year and have a major effect on flowering season in wild plants. There are also other factors, however, such as nutrient content in the substrate that can influence the onset of flowering in different plant species. It seems that zinc, as a mineral nutrient, may play here a special role.

Results revealed that the soil application of $ZnSO_4$ @ 10 kg per ha + foliar application of $ZnSO_4$ @ 0.5 percent taken less days to 50 percent flowering (early flowering). Similar finding were recorded by Ewa and Pawel (2012) indicating that Zn ions present in the growth medium promote early flowering in *A.arenosa* and this effect may depend on Zn concentration used. Zn-induced early flowering in *A. arenosa* seemed to be an universal plant response present within the species and is not an effect of stress or physiological adaptation to high Zn content in the environment. Mubeen *et al.* (2013) reported that spraying of NPK and zinc significantly increased the vegetative growth, leaf area, flowering growth and yield.

References

1. Ewa PW, Pawel W. Does zinc concentration in the substrate influence the onset of flowering in *Arabidopsis arenosa* (Brassicaceae). Plant Growth Regul. 2012; 22(2):213-224.
2. Grotz N, Guerinot ML. Molecular aspects of Cu, Fe and Zn homeostasis in plants. Biochem. Biophys. Acta. 2006; 17(63):595-608.
3. Khosa SS, Younis A, Rayit A, Yasmeen S, Riaz A. Effect of foliar application of macro and micro nutrients on growth and flowering of *Gerbera jamesonii* L. American-Eurasian. J. Agri. Environ. Sci. 2011; 11(5):736-757.
4. Mokhatr D, Asteraki H, Rouhollah R, Teimoor B. Investigation on effect of different rates phosphorus and zinc fertilizers on two cultivars Lentil (Gachsaran and Flip92-12L) in irrigation complement condition. Intl. J. Agri. Crop Sci. 2013; 5(1):1-5.
5. Verma CB, Lallu, Yadav RS. Effect of boron and zinc application on growth and yield of pigeonpea. Indian J. Pulses Res. 2004; 17(2):149-151.
6. Mubeen S, Shoib-ur-Rehman, Ayyub CM, Waqas Ahmad, Jamil S, Khawaja S. Modeling growth of cut-flower stock (*Matthiola incana*) in response to differing in nutrient level. Universal J. Food and Nutrition Sci. 2013; 1(1):4-10.