DOI : 10.5958/0974-0112.2015.00088.2

Indian J. Hort. 72(3), September 2015: 441-443

Short communication

Response of foliar feedings of urea and zinc on growth and yield of chilli cv. Pant C-3

M.S. Gusain, D.K. Singh and D.K. Rana*

Department of Vegetable Science, College of Agriculture, G.B. Pant University of Agriculture and Technology, Pantnagar 263 145, U.S. Nagar, Uttarakhand

ABSTRACT

A study was undertaken to find out the suitable concentration of zinc and urea for foliar application to maximize the production of chilli Pant C-3 under *Terai* areas. Urea was used as solution of 0.5, 1.0, 1.5 and 2.0% and zinc sulphate at 0.5, 1.0, 1.5 and 2.0%, respectively and pH was neutralized using slaked lime. Simple water was used as control. Among all the treatments, T_4 (urea @ 2.0%) showed maximum plant height (71.00 cm), number of branches per plant (21.40), stem diameter (1.25 cm), fruits weight per plant (86.6, 229.54 g/ plant), dry weight per fruit (0.491 g), fruit dry weight (20.46 %), number of seeds per fruit (38.0), 1000-seed weight (4.42 g) and seed yield per plant (7.21 g), which were superior then the control T_9. Foliar application of urea @ 2.0% followed by 1.5% and zinc sulphate @ 0.5% have better performance and can be recommended for higher production of chilli under *Terai* conditions of Uttarakhand.

Key words: Chilli, foliar application, urea, zinc sulphate.

Chilli (*Capsicum annuum* var. *accuminatum* L.) belongs to the family Solanaceae. It is very important spice and condiment crop, also used for vegetable purpose Choudhury (2). The foliar application of micronutrients has been reported to increase fruit set and yield in chilli (Baloach *et al*., 1; Patil and Ballal, 5). The beneficial effect of boron and zinc sprays in improving the crop growth leading to prolific bearing. The research work related to foliar feeding of zinc and urea has been done and reported by several workers so far but the information are lacking on seed production aspect. Among the soil factors, nutrients are more important to increase or decrease the productivity, as well as growth and developmental process of the plant. The micronutrients also play an important role in bio-synthesis of auxin, which may reduce the flower and fruit drop. Hence, keeping all these points in view, the attempts have been made to find out the suitable concentration of zinc and urea for foliar application to maximize the production of chilli.

The experiment was conducted during two spring-summer seasons at Vegetable Research Centre, G.B.P.U.A.&T., Pantnagar, Uttarakhand with a new cultivar of chilli PC-7 (Pant C-3). The experiment was carried out in RBD with three replications. Urea was used as solution of 0.5, 1.0, 1.5 and 2.0% and zinc sulphate at 0.5, 1.0, 1.5 and 2.0%, respectively and pH was neutralized using slaked lime. Simple water was used for spray control. The foliar spray of urea and zinc sulphate was done 1st at flower initiation and 2nd at 20 days later after the 1st spray. Observations were recorded for 19 quantitative traits, *viz*., plant height (cm), number of primary branches, stem diameter (cm), stem periphery (cm), days to 50% fruit maturity, number of fruits/plant, fruit weight/plant (g), fruit length (cm), fruit diameter (cm), fruit periphery (cm), fruit dry weight (g), yield/plot (kg), yield (q/ha), number of seeds/fruit, seeds weight/fruit (g), husk weight (g), seed : husk ratio, 1000-seed wt. (g), and seed yield per plant (g) on five randomly selected plants. The data were analyzed according to the procedure of analysis of randomized block design with three replications (Snedecor and Cochran, 8).

The data presented in Table 1 showed significant difference among the treatments for plant height at final picking stage. Among all the treatments, T_4 (urea @ 2.0%) showed the maximum plant height (71.00 cm) and minimum plant height (66.96 cm) was recorded under control (T_9). Primary branches per plant were recorded significant difference among all the treatments (Table 1). Data indicated that maximum number of branches per plant was recorded in T_4 urea @ 2.0% (21.40), similarly minimum was also recorded under the control treatment T_9 (18.13). The maximum stem diameter was recorded in treatment T_3 urea @ 2.0% (1.25 cm) and T_4 urea @ 1.5% (1.25 cm) and minimum stem diameter was recorded in control T_9 (1.10 cm). The stem periphery was also recorded maximum in treatment T_4 urea @ 2.0% (3.94 cm) as compared to control T_9 (3.47 cm),

*Corresponding author's present address: Department of Horticulture, Chauras Campus, HNB Garhwal University, Srinagar (Garhwal) 246174, Uttarakhand; E-mail: drdkrana@gmail.com

which was recorded as minimum stem periphery. The mean values for the growth characters showed appreciable increase with increasing concentrations of urea and lower concentrations of zinc sulphate. The increase in growth characters, *viz.*, plant height, primary branches, stem diameter and stem periphery may be attributed to the increase in better absorption and uptake of nitrogen as nitrogen is the primary constituents of chlorophyll and protein synthesis as well as the important component of protoplasm. The accumulation of photosynthates ultimately improve the plant height, primary branches, stem diameter and stem periphery that also have been reported by Hatwar *et al.* (3) and Natesh *et al*. (4). The lower concentrations of zinc sulphate increase the stem diameter as well as stem periphery. It might be due to the fact that lower concentrations favour the chlorophyll formation and also influence the cell size as well as cell wall of the plant (Rafique *et al*., 6). Days to 50 per cent fruit maturity was influenced by lower concentrations of zinc sulphate. Early fruit maturity in micro-nutrient treatment was also reported by Shil *et al.* (7).

The experimental results and Table 2 showed that all the treatments of urea and lower concentrations of zinc sulphate significantly increased the number of fruits per plant and fruits weight per plant. More number of fruits as well as weight per plant was observed highest in treatment T_4 urea @ 2.0% (86.6, 229.54 g/plant). The increase in number and weight of fruits might be due to favorable conditions under these treatments. The result of the investigation are in accordance with the finding of Natesh *et al.* (4), which showed the maximum number of fruits and weight of fruits per plant in foliar application of zinc sulphate applied at two stages of the plant. The result (Table 2) showed that dry weight/fruit, per cent fruit dry weight, number of seeds per fruit, 1000-seed weight and seed yield per plant was significantly influenced by urea and zinc sulphate concentrations. The highest values were obtained under treatment T_4 (urea @ 2.0%) for dry weight per fruit (0.491 g), per cent fruit dry weight (20.46%), number of seeds per fruit (38.0), 1000-seed weight (4.42 g) and seed yield per plant (7.21 g), which were superior then the control T_9. The improvement in these characters may be because of better absorption of nitrogen as well as zinc sulphate, which ultimately increase the accumulation of carbohydrate in the fruits and provide better environment for growth and developmental processes. These findings also confirm the findings of Rafique *et al.* (6) who have reported that foliar feeding of urea (0.5 to 2.0%) and zinc sulphate (0.1 to 0.5%) increased the yield and yield contributing characters. The fruit yield per plot as well as total fruit yield per plant was significantly increased with the application of urea and zinc sulphate treatment (Table 2). The highest plot yield was observed in treatment urea @ 2.0% (3.31 kg/ plot) followed by treatment zinc sulphate @ 0.5% (3.27 kg/plot). Similarly the maximum total fruit yield was obtained under treatment urea @ 2.0% (90.92 q/ha) followed by treatment zinc sulphate @ 0.5% (84.02 q/ ha). The improvement in yield might be due to better absorption of nitrogen, as well as zinc sulphate. All the vegetative characters, *viz.*, plant height, primary branches per plant, number of fruit per plant, weight of fruit per plant *etc*. have positive association with the total fruit yield. The results of the present investigation are in accordance with those of Shil *et al.* (7). The plot yield and total fruit yield were significantly influence by the foliar application of urea and zinc sulphate. This might be due to the fact that the plant received more zinc and urea, which

Table 1. Response of foliar feedings of urea and zinc sulphate on growth characters of chilli.

Treatment	Plant height (cm)	No. of primary br.	Stem dia. (cm)	Stem periphery (cm)	Days to 50% fruit maturity
T_1 (urea 0.5%)	68.53	20.40	1.21	3.79	136.3
T_2 (urea 1.0%)	69.00	21.06	1.24	3.91	137.0
T_3 (urea 1.5%)	69.92	21.13	1.25	3.93	138.0
T_4 (urea 2.0%)	71.00	21.40	1.25	3.94	138.7
T_5 (zinc sulphate 0.5%)	69.16	20.86	1.21	3.82	131.7
T_6 (zinc sulphate 1.0%)	68.53	19.73	1.20	3.79	132.3
T_7 (zinc sulphate 1.5%)	68.33	19.26	1.15	3.67	133.0
T_8 (zinc sulphate 2.0%)	67.69	18.53	1.11	3.57	133.3
T_9 (control)	66.96	18.13	1.10	3.47	139.0
CD at 5%	2.18	2.17	0.07	0.32	5.12

Table 2. Response of foliar feedings of urea and zinc sulphate on yield and yield contributing characters in chilli.

Treatment	No. of fruits/ plant	Fruit wt./ plant (g)	Fruit length (cm)	Fruit dia. (cm)	Fruit periphery (cm)	Yield per plot (kg)	Total fruit yield (q ha^{-1})	Dry wt./fruit (g)	Husk wt. (g)	Seed : husk ratio	Fruit dry wt. (%)	No. of seeds per fruit	1000-seed wt. (g)	Seed yield/ plant (g)
T_1 (urea 0.5%)	77.3	218.66	8.03	1.05	3.33	3.11	81.08	0.484	8.07	1: 4.98	16.90	36.7	4.30	6.26
T_2 (urea 1.0%)	78.3	222.00	8.11	1.06	3.34	3.22	81.50	0.485	8.09	1: 4.99	17.22	37.3	4.34	6.34
T_3 (urea 1.5%)	81.3	223.66	8.62	1.07	3.37	3.24	83.91	0.488	8.11	1: 4.91	17.95	37.7	4.35	6.73
T_4 (urea 2.0%)	86.6	229.54	8.67	1.09	3.41	3.31	90.92	0.491	8.15	1: 4.88	20.46	38.0	4.42	7.21
T_5 (zinc sulphate 0.5%)	80.0	225.26	8.02	1.08	3.40	3.27	84.02	0.469	7.79	1: 4.93	18.79	35.7	4.35	6.33
T_6 (zinc sulphate 1.0%)	74.6	220.10	7.80	1.07	3.36	3.23	82.54	0.467	7.76	1: 4.91	17.73	35.3	4.33	5.89
T_7 (zinc sulphate 1.5%)	72.3	212.00	7.73	1.06	3.35	3.15	80.89	0.465	7.45	1: 4.80	16.87	34.3	4.32	5.61
T_8 (zinc sulphate 2.0%)	69.6	209.16	7.72	1.05	3.32	3.04	80.65	0.457	7.61	1: 4.94	16.56	34.0	4.29	5.37
T_9 (control)	65.0	206.53	7.68	1.04	3.32	3.02	80.54	0.445	7.48	1: 5.30	16.10	32.3	4.23	5.00
CD at 5%	4.17	6.28	0.30	0.07	0.05	0.86	2.51	0.026	0.41	-	2.61	3.54	1.18	0.44

produced larger canopy development associated with profuse branching and more phothosynthets @ thus there was positive response on yield and yield contributing characters, *viz*., flowering, less fruit drop and more fruit set, which reflects the fruit yield. These findings are in accordance with Hatwar (3). Thus, it may be concluded that foliar application of urea @ 2.0% followed by 1.5% and zinc sulphate @ 0.5% have better performance in chilli and may be recommended for higher production of chilli under *Terai* conditions of Uttarakhand.

REFERENCES

1. Baloch, Q.B., Chachar, Q.I. and Tareen, M.N. 2008. Effect of foliar application of macro and micro nutrients on production of green chilies (*Capsicum annuum* L.). *J. Agric. Tech.* **4**: 177-84.

2. Choudhury, B. 1976. Chilli, **In**: *Vegetables* (4th Edn.), National Book Trust India, New Delhi, pp. 63-69.

3. Hatwar, G.P., Gondane, S.U., Urkude, S.M. and Gahukar, O.V. 2003. Effect of on growth and yield of chilli. *J. Soils Crops*, **13**: 123-25.

4. Natesh, N., Vyakaranahal, B.S., Shekhargouda, M. and Deshpande, V.K. 2005. Effect of micronutrient and organics on growth, seed yield and quality of chilli. *Karnataka J. Agric. Sci.* **18**: 334-37.

5. Patil, P.K. and Ballal, A.L. 1980. Effect of seed and foliar sprays of various plant growth regulatores on flower drop and yield of green chilli (*Capsicum annuum* L.) variety NP-46-A. *J. NAU*, **5**: 195-97.

6. Rafique, A., Abdul, M. and Ahmed, A. 2004. Effect of micronutrient supplement in growth and development of okra (*Abelmoschus esculentus* L. Moench). *Bangladesh J. Bot.* **33**: 129-31.

7. Shil, N.C., Naser, H.M., Brahma, S., Yousuf, M.N. and Rashid, M.H. 2013. Response of chilli (*Capsicum annum* L.) to zinc and boron application. *Bangladesh J. Agril. Res*. **38**: 49-59.

8. Snedecor, G.W. and Cochran, W.G. 1968. *Statistical Methods* (6th Edn.), Oxford and IBH Pub. Co. Calcutta.

Received : November, 2011; Revised : February, 2015; Accepted : April, 2015