

## Enhancing the Onion (*Allium cepa* L.) productivity through foliar application of micro nutrients

VIKASH HOODA<sup>1</sup> AND POOJA RANI

Assistant Professor, Dept. of Soil Science, CCSHAU, Hisar

### Abstract

A field experiment was conducted as "On Farm Trail" on farmer field by Krishi Vigyan Kendra, Sadalpur, CCSHAU, (Hisar), Haryana during the rabi season 2019-20. Trail was conducted at ten farmers' field at different location of district Hisar. The rabi onion variety Hisar Onion 4 was used for experimentation. The micronutrients were applied to the onion crop through foliar spray of "Multiplex General" which contains Zinc 3.0%, Boron 0.5%, Iron 1.5% and Copper 0.5%. Foliar spray of micronutrients mixture @250ml in 100 liters of water per acre was done at 45 and 60 days after transplanting of the crop along with the control treatment i.e. no spray of micronutrients. The maximum and significantly higher yield i.e. 271.25 q/ha was reported in the treatment where micronutrients were applied at 45 and 60 days after planting.

Keywords: Foliar application, Onion, micronutrients

### Introduction

Onion (*Allium cepa* L.) is one of the most important commercial vegetable crops grown in India. It is widely grown in most of the countries of the world. It is mainly grown for bulb and an inevitable item of kitchen for every household. In India, onion is consumed as a vegetable and condiment. The edible part of onion is green leaves, immature and mature bulbs. It is used in salad, as spice in soups and many other dishes and is cooked alone as a vegetable. The pungency in onion is due to the presence of Allylpropyle disulfide (Malik, 1994). In addition to its medicinal properties, it is a good source of carbohydrates, vitamin-A, protein, riboflavin etc.

Globally, an increase in 53.49% area, 72.87% in production and 12.63% in productivity of onion in last decade indicates its scope and growth. In India, it helps in earning of foreign exchange through export. India is the largest producer of onion next to China in the world and the major exporter across the globe. Due to intensive cropping, less or no use

of organic manures, no use of micro nutrients and imbalanced use of fertilizers, soil health is deteriorating day by day. Plant requires 17 nutrient elements to complete its lifecycle. Among these, the nine nutrient elements, which are required by the plants in large amount and are measured in kilogram per hectare are macro nutrients e.g. C, H, O, N, P, K, Ca, Mg, S and other which are required in very less quantity and measured in parts per million (ppm) are micronutrients e.g. iron (Fe), manganese (Mn), zinc very small quantity but these are important in cell division and carbohydrates metabolism in plant growth. Application of boron increases bulb size and yield of onion (Smriti *et al.*, 2002). The research work on the effect of micronutrients on the growth, yield and quality of onion in India and specially Haryana is very limited, although it is needed to determine micronutrient requirement of the onion crop. In consideration with the above situations, an attempt has been made to study the effect of micronutrients on growth, yield & quality of onion in presence of N, P & K.

<sup>1</sup>Assistant Professor, SNIATTE, CCSHAU, Hisar

## Materials and Methods

The experiment was conducted as “On-farm-Trial” at farmer’s fields in district Hisar of Haryana, India on onion variety Hisar Onion 4 for consecutive years during 2019-20 during Rabi season i.e., Jan. – May. The seed of Var. HO 4 is released from department of Vegetable Science, Chaudhary Charan Singh Haryana Agricultural University, Hisar. The seed was treated with carbendazim @ 2.5g/kg seed as dry dressing as per package and practices adopted for Haryana state. The treated seed was sown in lines in well prepared nursery beds on 10th and 12th of November during first and second year of experimentation, respectively. Proper thinning, weeding and other nursery care operations were carried out till the transplanting of seedlings in the main field. Nursery was raised commonly for both treatments and micronutrients were applied as per treatment in the main field. Only healthy and vigorous (15cm long) seedling of the crop was transplanted at a spacing of 15 x 10 cm during first week of January 2019 and 2020, respectively. There were two treatments i.e., T1= control (no application of micronutrients) and T2 = application of micronutrients at 45 and 60 days after transplanting through foliar spray. These micronutrients were applied to the onion crop during *Rabi* season (January to May) through foliar spray of “Multiplex General” which contains zinc 3%, Boron 0.50%, Iron 1.50% and copper 0.50%. Foliar spray @ 250 ml of “Multiplex General” in 100 liters of water per acre was done at 45 and 60 days after transplanting of the crop. Trial was conducted at ten farmers’ field in Hisar district comprising of 0.5 acre area as plot size. Yield data was recorded and economics of onion production was calculated by keeping a record on each operation carried out, number of labours engaged, power and inputs utilized. The gross and net returns (Rupees per hectare) were calculated considering the prevailing market price of input and produce. Benefit cost ratio, represents the returns per rupee invested, was worked out for different package of practices under each treatment by dividing Gross returns with corresponding cost of cultivation.

Net returns = Gross return - Cost of cultivation

B: C ratio = Gross return / Gross cost

## Results and Discussion

The data on growth parameters such as plant height and number of leaves was recorded and number of leaves has been recorded and presented in Table 1, showed that foliar application of micronutrients significantly increase plant height (63.50 cm) over the control whereas no significant result was noticed in number of leaves per plant. Dakeet *et al.* (2011) and Abd EI- Samad *et al.* (2011), they reported that growth parameters of onion plant were positively affected by foliar application of micronutrients. The improvement in plant growth might be due to its role in many physiological processes and cellular functions within the plants. In addition, zinc and boron play an essential role in improving plant growth, through the biosynthesis of endogenous hormones, which is responsible for promotion of plant growth.

The maximum and significantly higher yield *i.e.*, 271.25 q/ha was recorded in the treatment where micronutrients were applied at 45 and 60 days after planting (T<sub>2</sub>) which was 8.5% higher over the control treatment. These results obtained from the present experiment are in close conformity with the result of Pramanik *et al.*, (2020), they observed significantly higher vegetative growth in terms of plant height, number of leaves per plant, collar thickness, average bulb weight, total bulb yield per plot and per hectare was recorded when crop was treated with recommended 150:50:80:30 NPKS kg ha<sup>-1</sup> +20 t ha<sup>-1</sup> FYM + micronutrient mixture *i.e.*, Fe- 2.5 %, B-0.5%, Zn -3%, Cu -1% and Mn-1% @ 0.5% as foliar application at 30 and 45 DAP. This might be due to the active role of micronutrients in the plant metabolic process starting from cell wall development to respiration, photosynthesis, chlorophyll formation, enzyme activity and nitrogen fixation.

The yield attributes *i.e.*, bulb diameter, weight and yield as influenced by micronutrients application (Table 1) exhibited that micronutrients ‘application produced bigger size bulb, which reflected a significant increase in bulb diameter (6.15cm) and bulb weight (53.30 g) than that of untreated control and likewise the maximum and significantly higher yield *i.e.*, 271.25/ha was recorded in the treatment where micronutrients were applied at 45 and 60 days

Table 1: Effect of foliar spraying of micronutrients on growth, yield and quality of onion

Treatment	Plant height (cm)	No. of leaves/ Plant	Bulb diameter (cm)	Bulb Weight (g)	Yield (q/ha)
T1: No Spray of Micro nutrients	56.40	5.25	4.35	47.80	250
T2: Foliar application of Micronutrients	63.50	6.50	6.15	53.30	271.25
CD at 5%	5.61	NS	0.38	5.42	21.5

NS: Non-significant ( $P > 0.05$ )

Table 2: Effect of foliar spraying of micronutrients on Economics of onion crop

Treatments	Yield (q/ha)	Gross cost (Rs./ha)	Gross Return (Rs./ha)	Net return (Rs./ha)	B:C ratio
T1: No spray of micronutrients	250	75000	200000	125000	2.67
T2: Foliar spray of micronutrients	271.25	77500	217000	139500	2.80

\*Onion bulbs were sold @ Rs.800/q and yield increase by 8.5% over the control.

after planting (T2). These results obtained from the present experiment are in close conformity with the result of Pramaniket al (2020), they observed significantly higher vegetative growth in terms of plant height, number of leaves per plant, collar thickness, average bulb weight, total bulb yield per plot and per hectare was recorded when crop was treated with recommended 150:50:80:30 NPKS kg ha<sup>-1</sup> +20 t ha<sup>-1</sup> FYM + micronutrient mixture i.e., Fe- 2.5 %, B-0.5%, Zn -3%, Cu -1% and Mn-1% @ 0.5% as foliar application at 30 and 45 DAP. This might be due to the active role of micronutrients in the plant metabolic process starting from cell wall development to respiration, photosynthesis, chlorophyll formation, enzyme activity and nitrogen fixation.

The bulb weight and bulb diameter of onion were increased due to higher photosynthate accumulation in the bulb and higher number of leaves per plant. This might be due to better efficacy of micronutrient mixture in increasing vegetative growth and bulb yield as observed in the present study as micronutrients play a pivotal role in strengthening plant cell walls and translocation of carbohydrates from leaves to other plant parts indicates possibility of increasing dry matter percentage as well as yield

(Hanch and Mendel, 2009). Whereas, Alam *et al.* and Acharya *et al.* (2015) stated a significant effect of zinc and boron application on dry matter production of onion.

The data pertaining to the results on production economics (Gross return, Net return and BCR) of onion as influenced by micronutrients revealed a significant variation between treatments (Table 2). The foliar application of micronutrient (Zinc 3%, Boron 0.5%, Iron 1.5% and copper 0.5%) @ 2.5% at 45 and 60 DAP recorded significantly highest gross return (2.17 lakh/ha) as well as net income (1.39 lakh/ha) as compared to control treatment (2.00 lakh/ha) and (1.25 lakh/ha) respectively. This higher gross return was obviously due to the higher total bulb yield with application of micronutrients, as revealed in the present study. Similar trend was also observed for Benefit Cost Ratio (BCR), highest being calculated in T<sub>2</sub> (2.80) followed by T<sub>1</sub> (2.67). This was obviously due to significantly higher total bulb yield. Thus, in general, it may be concluded that application of micronutrients mixture, preferably as foliar spray at 45 and 60 DAP increased all the economic parameters of gross and net returns as well as benefit cost ratio indicating the feasibility of use of micronutrients for optimum

profit in commercial cultivation of onion. The present results corroborate the findings of Smiriti *et al.* (2002) for boron while Nasreen *et al.* (2009) and Pramanik *et al.*, (2020) for zinc as a source of micronutrients towards increased benefit cost ratio in onion production.

### Conclusion

Based on consecutive year findings of the experiment, it may be concluded that combined application of micronutrients mixture (Zinc 3.0%, Boron 0.5%, Iron 1.5% and Copper 0.5%) @ 250ml per 100 liters of water at 45 and 60 days after transplanting was found to be better for higher growth, yield and economic parameters of onion, hence may be recommended that application micronutrients gives better vegetative growth in term of number of leaves, bulb weight and bulb production along with higher BC ratio in onion as compare to control treatment.

### References

- Abd El-Samad, E.H.; Khalifa, R.K.M.; Lashine, Z.A. and Shafeek, M.R. (2011). Influence of urea fertilization and foliar application of some micronutrients of growth, yield and bulb quality of onion. *Australian Journal of Basic and Applied Sciences*,**5**:96-103.
- Acharya, U.; Venkatesan, K.; Saraswathi, T. and Subramanian, K. S. (2015). Effect of zinc and boron application on growth and yield parameters of multiplier onion (*Allium cepa* L. var. aggregatum Don.) var. CO-5. *International Journal of Research (IJR)*. 2(1): 757-765.
- Alam, M.N.; Abedin, M.J. and Azad, M.A.K. (2010). Effect of micronutrients on growth and yield of onion under calcareous soil environment. *International Research Journal of Plant Science*,**1**:56-61.
- Dake, S.D.; Hiwale, B.G.; Patil, V.K. and Naik, P.G. (2011). Effect of micronutrients on growth, yield and quality of onion (*Allium cepa* L.) cv. Baswant 780. In: *Proceedings of National Symposium on Alliums: Current Scenario and Emerging Trends*. Pune, India: VAMICOM.
- Hansch, R. and Mendel, R.R. (2009). Physiological functions of mineral micronutrients (Cu, Zn, Mn, Fe, Ni, Mo, B, Cl). *Current Opinion in Plant Biology*,**12**:259-266.
- Malik, M.N. (1994). Bulb crops, onion. In: *Horticulture*. Pp. 500-501. Islamabad, Pakistan: National book Foundation.
- Nasreen, S.; Yousuf, M.N.; Mamun, A.N.; Brahma, M.S. and Haque A.M. (2009). Response of garlic to zinc, boron and poultry manure application. *Bangladesh Journal of Agriculture Research*, **34**(2):239-245.
- Pramanik, K., Tripathy, P., Mandals, P., Pradhan, M. and Biswal, M. (2020). Effect of micronutrients on total dry matter yield and benefit cost ratio (BCR) in onion (*Allium cepa* L.). *International Journal of Ecology and Environmental Sciences*,**2**(3): 208-212.
- Smriti. S., Kumar, R. and Singh, S.K. (2002). Effect of sulphur and boron nutrition on growth, yield and quality of onion (*Allium cepa* L.). *Journal of applied Biology and Biotechnology*,**12**:40-46.