

Published with Open Access at **Journal BiNET**

Vol. 18, Issue 01: 1464-1469

Journal of Bioscience and Agriculture ResearchJournal Home: www.journalbinet.com/jbar-journal.html

Influence of micronutrient (boron) for the growth and yield of cauliflower

Md. Rakibul Hassan, Shamema Nasrin Julie, Ali Akber, Papon Kumar Kundu and Md. Sakif Zaman

Dept. of Horticulture, Sher-e-Bangla Agricultural University, Dhaka 1207, Bangladesh

✉ For any information: ask.author@journalbinet.com

Article received: 02.08.18; Revised: 25.09.18; First published online: 25 October 2018.

ABSTRACT

A field experiment was conducted at the Horticultural farm, Sher-e-Bangla Agricultural University, Dhaka-1207 during the period from October 2015 to February 2016 with micronutrient Boron applied to cauliflower cultivar, 'F₁ hybrid'. Four treatments viz., B₀: Control, B₁: 1kg ha⁻¹, B₂: 1.5kg ha⁻¹, B₃: 2kg ha⁻¹ was utilized in this experiment which was arranged in Randomized Complete Block Design with three replications. Maximum Plant height (41.66 cm), Leaf number (19.35), Leaf area (182.51 cm²), 50% curd initiation (47.23 days), pure curd weight (698.20 g), curd weight with leaves (1.56 kg), curd yield plot⁻¹ (1.53 kg) and curd yield ha⁻¹ (15.30 t) at harvest was found at B₃ treatment while lowest was (14.28 cm, 6.33 leaves, 121.85 cm², 48.44 days, 418.60 g, 1.07 kg, 1.05 kg, 10.49 ton ha⁻¹ respectively) was recorded from control. Therefore, result indicates that application of micronutrient (Boron) in supplement with recommended fertilizer at 2 kg ha⁻¹ will successfully increase growth and yield of cauliflower.

Key Words: Micronutrient, Cauliflower, Boron, Curd and Yield.

Cite Article: Hassan, M. R., Julie, S. N., Akber, A., Kundu, P. K. and Zaman, M. S. (2018). Influence of micronutrient (boron) for the growth and yield of cauliflower. Journal of Bioscience and Agriculture Research, 18(01), 1464-1469.

Crossref: <https://doi.org/10.18801/jbar.180818.181>



Article distributed under terms of a Creative Common Attribution 4.0 International License.

I. Introduction

Cauliflower (*Brassica oleracea*, Brassicaceae) is an economically important winter vegetable crop grown in Bangladesh (Akter et al., 2011). It is nutritionally rich which contains good amount of vitamins like riboflavin, thiamine, nicotinic acid and high quality of proteins and minerals like calcium and magnesium. 100 g of edible part of cauliflower (known as Curd) contains 89% moisture, 2.3 g protein, 50 mg vitamin C. In Bangladesh cauliflower covered in an area of 40970 hectares with a total production of 2, 11,585 metric tons (BBS, 2015). It can be grown in all types of soil with good soil fertility (Islam, 2008). Because of over mining of the soil nutrient by plants most of the micronutrients run short in supply to the crops and some disorder appears resulting in low yields (Joshi, 1997). Boron deficiency has been commonly reported in soils which are highly leached and/or developed from calcareous and alluvial deposits (Borkakati and Takkar, 2000). Several soil factors and conditions

render soils deficient in boron. For example, low soil organic matter content, coarse/sandy texture, high pH, liming, drought, intensive cultivation and more nutrient uptake than application, and the use of fertilizers which are poor in micronutrients are considered to be the major factors associated with the occurrence of boron deficiency (Niaz *et al.*, 2007). Therefore, productivity of cauliflower is not satisfactory due to poor soil fertility and imbalanced fertilization. Micronutrients deficiency is more prevalent in acidic soils.

In Bangladesh fertilizer application rate has increased than earlier in crop production but application of micronutrients has largely been neglected. Therefore, rational and optimum use of micronutrient coupled with recommended fertilizers would be beneficial for increasing curd yield per unit area. Boron is also an essential micronutrient for the growth of plant new cells. However, in case of cole crops such as cauliflower, broccoli and cabbage, boron requirement is very high. Boron normally becomes less available to plants with increasing soil pH. When calcium (Ca) availability is high, there is a greater requirement of boron for plant growth and yield (Tisdale *et al.*, 1995). Yield and yield components of crops were affected positively and negatively by boron depending upon soil status, type of crop and the doses used. Khanam *et al.* (2000) found that the application of boron is essential for improving yield potentiality of chickpea and lentil at BAU farm soil in Bangladesh. Application of different levels of boron influenced the growth and yield in different crops also reported by Efkar *et al.* (1995) in potato; Ali *et al.* (2001) in papaya and Sohel *et al.* (2006) in broccoli. Alam (2006) showed that application of boron at 2kg ha⁻¹ with NPKS increased cabbage head yield by 119% (on average) than NPKS alone. In fact information regarding B fertilizer requirements for vegetable should be meager in Bangladeshi soil. Therefore, an attempt was made to study the effect of boron levels on growth and yield components of cauliflower.

II. Materials and Methods

The single factor experiment was executed at Horticultural farm in Sher-e-Bangla Agricultural University, Dhaka, during the period of October 2015 to February 2016. The research work was carried out to evaluate the effect of boron on growth and yield of cauliflower with four treatments: B₀: Control, B₁: 1kg ha⁻¹, B₂: 1.5kg ha⁻¹, B₃: 2kg ha⁻¹ in Randomized Complete Block Design (RCBD) with three replications. Planting material was collected from Bangladesh Agricultural Research Institute (BARI). Twenty five days old seedlings (F₁ hybrid) were transplanted into the main field (plot size 3m × 1m) maintaining a required spacing of 60cm × 30cm. Manure and fertilizer was applied according to BARI recommended dose. Plants in each plot were selected randomly and tagged. The tagged plants were used for data recording according to the following characters: Plant height, Number of leaves plant⁻¹, Leaf area, Days to curd initiation, Days to 50% curd initiation, Days from curd initiation to harvest, Curd diameter, Curd weight, Curd weight with leaf at harvest, Curd yield plot⁻¹, and Curd yield ha⁻¹. The recorded data for different characters were analyzed statistically using "MSTAT-C" to find out the significance of variation among the treatments. Difference between treatments was evaluated by Duncan's Multiple Range Test (DMRT) test at 5% level of probability (Gomez and Gomez, 1984).

III. Results and Discussion

Plant height

Significant variation was observed due to different doses of micronutrient boron. Highest plant height 14.28 cm, 23.51 cm and 41.66 cm was observed in B₃ (2 kg ha⁻¹) treatment at 30, 50 DAT and at final harvest respectively. On the other hand, least value was recorded from B₀ (control) i.e. 12.97 cm, 22.36 cm and 39.94 cm. Alam (2007) reported that application of boron in cabbage significantly increase the plant height which is similar to the result of Talukder *et al.* (2000).

Number of leaves plant⁻¹

There was remarkable variation found in case of leaves per plant at 30 DAT and at final harvest. Boron (2 kg ha⁻¹) at B₃ treatment produced the maximum number of leaves per plant (6.33 and 19.35 respectively) while control treatment (B₀) represented the minimum number of leaves (4.87 and 17.44) per plant. This result was in accordance with Moklikar (2018) who observed that spraying of boron as a micronutrient effectively increases leaf number in case of cauliflower.

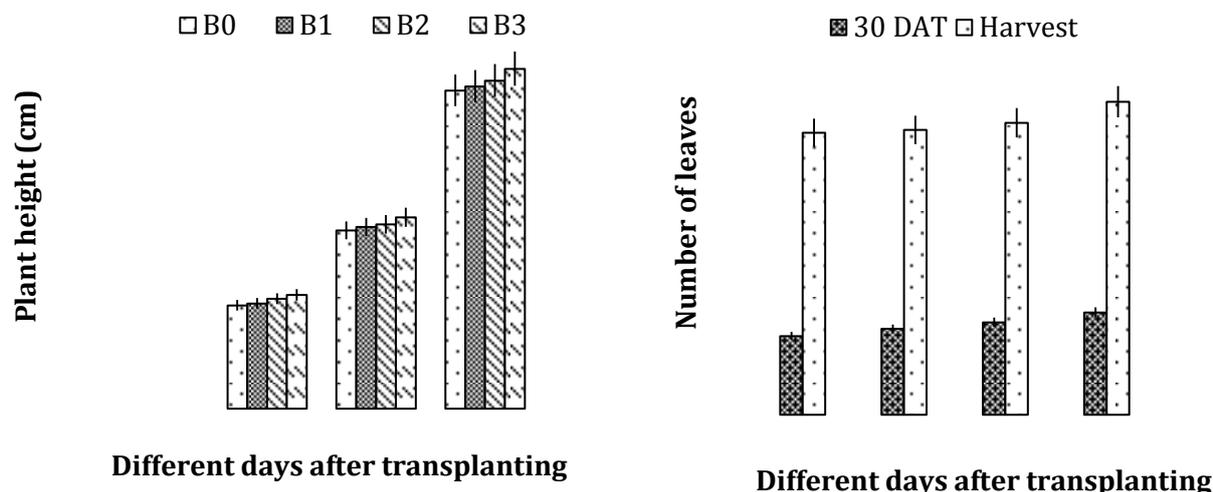


Figure 01. Effect of boron on plant height and leaf number on cauliflower

Leaf area

It is evident from the (Table 01) that there was observable variation in case of leaf area due to different doses of micronutrient boron. B₃ treatment (Boron @2kg boron ha⁻¹) produced the maximum (182.51cm²) leaf area whereas control (B₀ treatment) represented minimum leaf area (121.85cm²). This result was supported by Balyan *et al.* (2004).

Days to curd initiation

Maximum days (46.82) required for curd initiation was recorded in B₀ (control) treatment followed by B₂ (1.5 kg ha⁻¹) treatment and minimum days (43.65) were required in B₃ (2 kg boron ha⁻¹) treatment (Table 01).

Days to 50% curd initiation

Micronutrient boron application resulted significant variation in days to 50% curd initiation. Therefore, maximum days (48.44) were required in case of B₀ (control) treatment while minimum days (47.23) was in B₃ treatment (2 kg boron ha⁻¹) which is alike to Moklikar *et al.* (2018) (Table 01).

Days required for curd initiation to harvest

Maximum (11.81) days (Table 01) required for curd initiation to harvest was recorded from that of control (B₀) and minimum days (9.79) was recorded from B₃ treatment (2kg boron ha⁻¹). The result was in support with that of Mukhopadhyay *et al.* (2002).

Curd diameter

Curd diameter followed spectacular variation on Boron application (Table 01). Maximum curd diameter (13.67 cm) was found in B₃ treatment (2 kg boron ha⁻¹) and minimum (12.55 cm) was recorded from control (B₀) treatment.

Table 01. Effect of boron on leaf area, curd initiation, 50% curd initiation, curd initiation to harvest and curd diameter of cauliflower

Treatments	Leaf area (cm ²)	Curd initiation (days)	50% curd Initiation (days)	Curd initiation to harvest (days)	Curd diameter (cm)
B ₀	121.85 c	46.82 c	49.44 c	11.81 c	12.55 c
B ₁	135.96 c	45.08 c	49.03 bc	10.67 c	12.68 c
B ₂	161.13 b	44.26 b	48.53 b	10.14 b	12.92 b
B ₃	182.51 a	43.65 a	47.23 a	9.79 a	13.67 a
LSD _(0.05)	14.11	0.74	0.41	0.35	0.13
CV %	5.02	3.85	1.36	1.15	2.65

In a column, means with similar letter (s) are not significantly different by LSD at 5% level of significance.

B₀: Control, B₁:1 kg boron ha⁻¹, B₂: 1.5 kg boron ha⁻¹, B₃: 2 kg boron ha⁻¹

Pure Curd weight (g)

Curd weight differs significantly in case of different doses of boron. Highest (698.20 g) curd weight per plant was obtained from B₃ @2 kg boron ha⁻¹ whereas lowest (418.60 g) was recorded from control (B₀) treatment (Table 02).

Curd weight with leaf at harvest (kg)

Curd weight with leaf varied significantly due to the application of different doses of micronutrient treatments. Boron @2 kg ha⁻¹ represents maximum (1.56 kg) curd weight (B₃). On the other hand, control treatment (B₀) showed minimum (1.07 kg) curd weight with leaf at harvest (Table 02).

Curd yield plot⁻¹ (kg)

Data represented in (Table 02) showed variation of curd yield plot⁻¹ by the application of boron at different doses. Maximum (1.53 kg) curd yield per plot was obtained from B₃ (2 kg boron ha⁻¹) and minimum (1.05 kg) was recorded from control (B₀) treatment.

Curd yield ha⁻¹ (t)

Maximum curd yield per hectare (15.30 t ha⁻¹) was recorded from B₃ treatment (2 kg boron ha⁻¹) and minimum (9.56 t ha⁻¹) was obtained from control (B₀) (Table 02). Similar result was observed by Raghubanshi *et al.* (2013).

Table 02. Effect of boron on pure curd weight, curd weight with leaf, curd yield/plot and curd yield/ha at harvest of cauliflower

Treatments	Pure curd weight (g)	Curd weight with leaf at harvest (kg)	Curd yield plot ⁻¹ (kg)	Curd yield ha ⁻¹ (t)
B ₀	418.60 c	1.07 d	1.05 d	10.49 d
B ₁	477.40 c	1.14 c	1.16 c	11.16 c
B ₂	583.30 b	1.31 b	1.32 b	13.20 b
B ₃	698.20 a	1.56 a	1.53 a	15.30 a
LSD _(0.05)	52.20	0.07	0.11	0.64
CV %	6.38	2.84	3.20	7.38

In a column, means with similar letter (s) are not significantly different by LSD at 5% level of significance.

B₀: Control, B₁: 1 kg boron ha⁻¹, B₂: 1.5 kg boron ha⁻¹, B₃: 2 kg boron ha⁻¹

IV. Conclusion

Insufficient quantity of micronutrient in the crop field might be considered as one of reason behind lower yield of cauliflower in Bangladesh and as a micronutrient boron had significant effect on curd yield of cauliflower. In this regard, application of boron (2 kg ha⁻¹) as micronutrient supplemented with recommended fertilizer could be an effective measure for cauliflower production in Bangladesh.

Acknowledgement

The author is very grateful to Shamema Nasrin Julie, Ali Akber newton, Papon Kundo and Md. Zaman for technical support, helping with experiment layout and other management practices.

V. References

- [1]. Akter S., Islam M. S. and Rahman M. S. (2011). An economic analysis of winter vegetables production in some selected areas of Narsingdi district. *Journal of Bangladesh Agricultural University*, 9(2), 241–246.
- [2]. Alam, M. N. (2006). Effect of vermicompost and some chemical fertilizers on yield and yield components of selective vegetable crops. (Ph.D. Thesis). Faculty of Agriculture, University of Rajshahi, Bangladesh.

- [3]. Alam, M. N. and Jahan, N. (2007). Effect of Boron Levels on Growth and Yield of Cabbage in Calcareous Soils of Bangladesh. *Research Journal of Agriculture and Biological Sciences*, 3(6), 858-865.
- [4]. Ali, M. A., Islam M. F., Malik M. A. Karim, Monir M. A. and Karim M .R. (2001).Effect of added boron on the yield of papaya in High Ganges River Floodplain soil. *Bangladesh Journal of Agricultural Science*, 28(2), 205-208.
- [5]. Balyan, D. S., Dhanker, S. B. and Shelpi, E. (2004). Effect of nitrogen and zinc on yield of cauliflower var. Snowball-16. *Haryana Agricultural University Journal Research*, 24(2-3), 88-92.
- [6]. BBS (2015).Year Book of Agricultural Statistics of Bangladesh, Statistics Division, Ministry of Planning, Govt. of the Peoples Republic of Bangladesh. p. 58.
- [7]. Borkakati, K. and Takkar, P. N. (2000). Forms of boron in acid alluvial and lateritic soils in relation to ecosystem and rainfall distribution. In: Proceedings of International Conference on Managing Resources for Sustainable Agricultural Production in the 21st Century. *Better Crops*. 2, 127-128.
- [8]. Efkar, A., Jan, N., Kharttak, S. G., khattak M. J. and Ahmad E. (1995). Potato yield as affected by boron fertilizer mixing with and without farmyard manure. *Sarhad Journal of Agricultural pakistan*, 11(6), 725-728.
- [9]. Gomez, K. A. and Gomez, A. A. (1984). Statistical procedures for agricultural research. 2nd edn. *John Wiley and Sons*. New York: 680.
- [10]. Islam, M. S. (2008). Soil fertility history, present status and future scenario in Bangladesh. *Bangladesh Journal Agriculture and Environment*, 4, 129-151.
- [11]. Joshi, D. (1997). Soil fertility and fertilizer use in Nepal. Soil Science Division, pp. 320-325.
- [12]. Khanam, R., Arefin, M. S., Haque, M. A. and Jahiruddin. M. (2000). Effect of magnesium, boron and molybdenum on the growth, yield, and protein content of chickpea and lentil. *Progress in Agriculture*, 11, 77-80.
- [13]. Moklikar, M. S., Waskar, D. P., Maind, M. M. and Bahiram, V. K. (2018). Studies on Effect of Micro Nutrients on Growth and Yield of Cauliflower. *International Journal of Current Microbiology and Applied Sciences*, 6, 2351-2358.
- [14]. Mukhopadhyay, T. P. and Jana, E. C. (2002). Boron, zinc and molybdenum in growth and yield of cauliflower grown in Trai region of West Bengal. *Indian Journal of Horticulture*, 12(2), 71-76.
- [15]. Niaz, A., Ranjha, A., Rahmatullah, M., Hannan, A. & Waqas, M. (2007). Boron status of soils as affected by different soil characteristics–pH, CaCO₃, organic matter and clay contents. *Pakistan Journal of Agricultural Sciences*, 44, 428-435.
- [16]. Raghubanshi, J. D., Berger, K. S. and Truog, E. (2013). Response of NPK with boron on growth and curd yield of cauliflower. *Indian Journal of Horticulture*, 7(1-2), 77-85.
- [17]. Sohel, M. M., Islam, M. A., Dasand, A. C. and Mondal, M. F. (2006). Effects of potassium and boron on the growth and yield of broccoli. *Journal of Bangladesh Social Agricultural Science and Technology*, 3(3& 4), 49-52.
- [18]. Talukder, A. S. M. H. M., Nabi, S. M., Shaheed, M. M. A., Karim, M. R. and Goffar, M. A. (2000). Influence of S, B, and Mo on cauliflower in grey terrace soils. *Bangladesh Journal of Agricultural Research*, 25 (3), 541-546.
- [19]. Tisdale, S. L., Nelson, W. L. and Beaton, J. J. (1985). Soil fertility and fertilizers, New York: Macmillan.

HOW TO CITE THIS ARTICLE?

Crossref: <https://doi.org/10.18801/jbar.180118.181>

MLA

Hassan et al. "Influence of micronutrient (boron) for the growth and yield of cauliflower". *Journal of Bioscience and Agriculture Research*, 18(01) (2018) 1464-1469.

APA

Hassan, M. R., Julie, S. N., Akber, A., Kundu, P. K. and Zaman, M. S. (2018). Influence of micronutrient (boron) for the growth and yield of cauliflower. *Journal of Bioscience and Agriculture Research*, 18(01), 1464-1469.

Chicago

Hassan, M. R., Julie, S. N., Akber, A., Kundu, P. K. and Zaman, M. S. "Influence of micronutrient (boron) for the growth and yield of cauliflower". Journal of Bioscience and Agriculture Research, 18(01) (2018), 1464-1469.

Harvard

Hassan, M. R., Julie, S. N., Akber, A., Kundu, P. K. and Zaman, M. S. 2018. Influence of micronutrient (boron) for the growth and yield of cauliflower. Journal of Bioscience and Agriculture Research, 18(01), pp. 1464-1469.

Vancouver

Hassan, MR, Julie, SN, Akber, A, Kundu, PK and Zaman, MS. Influence of micronutrient (boron) for the growth and yield of cauliflower. Journal of Bioscience and Agriculture Research. 2018 October 18(01): 1464-1469.

Access by Smart Phone



Journal BiNET | Scientific Publication

- ✓ Faster processing & peer review
- ✓ International editorial board
- ✓ 29 business days publication
- ✓ Greater audience readership
- ✓ Indexing & bibliographic integration
- ✓ Social sharing enabled

Submission or email to submit@journalbinet.com

www.journalbinet.com/article-submission-form.html