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# GROWTH PERFORMANCE OF LENTIL BY THE EFFECT OF IRRIGATION AND BORON SPLITTING ASFOLIAR APPLICATION

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## Abstract

A field experiment was conducted for evaluating the effect of irrigation and boron splitting as foliar spray on growth and yield of lentil at the Research Field of the Department of Agronomy, Sher-e-Bangla Agricultural University, Dhaka from November, 2018 to March, 2019.Three levels of irrigation *viz*., $I_0$: control, $I_1$: one irrigation at 25 days after sowing (DAS), $I_2$: two irrigations at 25 DAS and 40 DAS and boron was applied by four levels *viz*., $B_0$: control, $B_1$: 80% recommended dose as basal + rest 20% as foliar spray (FS) at pre-flowering (PF), $B_2$: 60% RD as basal + rest 40% as FS at PF, $B_3$: 40% RD as basal + rest 60% as FS at PF. The experiment was fully set up in a split-plot design with three replications. Two irrigations at 25 and 40 DAS result produced that the highest plant length, branches plant$^{-1}$, leaves plant$^{-1}$, dry weight plant$^{-1}$. On the other hand, $B_3$ (40% RD as basal + rest 60% as FS at PF) produced significantly the highest growth of lentil. Result also showed that the highest plant length (27.59 cm), number of branches (5.73) and plant dry matter (4.83 g) recorded from $I_2B_3$ combinations. Therefore, the combination of two irrigations at 25 and 40 DAS and boron at 40% RD as basal + rest 60% as foliar spray at pre-flowering might be considered as effective dose for the cultivation of lentil in Bangladesh.

## Introduction

Legumes are considered the world's most essential food source after cereals, as they are the main protein and energy sources for humans. It is cultivated in an area of 898 million ha in Bangladesh with 389 million tons of output and 434 kgha$^{-1}$of productivity (BBS, 2018). According to the recommendation of the FAO (2013), a minimum pulse intake per capita should be 80 g per day, whereas in Bangladesh it is only 17.92 g per day. It belongs to the Papilionaceae sub Family under the Leguminosae. Seed contains 25% protein, 1.1% fat and 59% carbohydrate. A significant amount of vitamin A and B is also provided by lentil. Totally in Bangladesh, 176,633 metric tons of lentil from an area of 385399 million hectares were produced during 2017-2018 (BBS, 2018). Soil is the major factor in many parts of the world which limits crop production. Plant physiological processes for example photosynthesis, cellular growth and turgidity, etc. are directly or indirectly influenced by irrigation (Reddi and Reddi, 1995). Siliquae per plant, seed and oil yield decreased with higher water pressure (Rahnema and Bakhshandeh, 2006).Inadequate water supply in growing stage, may decrease quantity and quality of crop (Debaeke and Aboudrare, 2004). In contrary, nutrient leaching, reduced crop production and wastage of water are also reported (Pang *et al.*, 1997; Sezen *et al.,* 2006). Foliar application of nutrients can increase the use of nutrients and reduce pollution by lowering the amount of fertilizer applied to the soil directly (Abdo, 2001). Boron is an addictive substance in the growth, development and quality of plants (Pilbeam and Kirkby, 1983; Marschner, 1995; Brown *et al.*, 1999; Dordas *et al.*, 2007). Boron also plays a crucial role in sugar exchange, nitrogen fixation, protein

synthesis, sucrose synthesis, cell wall formation, membrane stability and $K^+$ movement (Singh *et al.,* 2014). Boron deficiency results in plant sterility due to reproductive tissue malformation that affects pollen germination, leading to increased flower fall and decreased fruit area (Subasinghe *et al.,* 2003). Considering the above facts, the present work was carried out to examine the effect of irrigation and boron levels on the growth of lentil.

## Materials and Methods

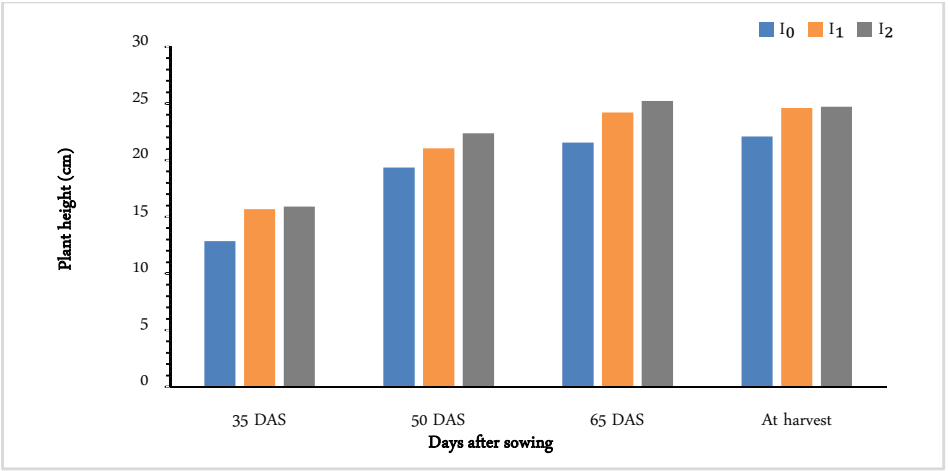
The experiment was conducted at the Agronomy Research Field, Sher-e-Bangla Agricultural University, Dhaka-1207 during the period from November, 2018 to March, 2019. The research field soil is slightly acidic with a low content of organic matter. Before sowing, lentil var. BARI Mushur 6 seeds were tested for germination (over 90%). The experiment was set up in November in a split-plot design where accommodated irrigation treatments viz. Control ($I_0$), one irrigation ($I_1$) at 25 days after sowing (DAS), two irrigations ($I_2$) at 25 and 40 DAS in main plot and boron levels viz. $B_0$ = 0 kg B/ha (Control), $B_1$=80% recommended dose of B as basal + Rest 20% as foliar spray (BF) at pre-flowering (PF), $B_2$ = 60% RD of B as basal + Rest 40% as FS at PF, $B_3$= 40% RD of B as basal + Rest 60% as FS at PF in sub-plot. The size of the each unit plot was 2.5m× 1.5m. The distance maintained between two blocks and plots were 0.5m and 0.3m, plant to plant distance 6cm. The land was fertilized with urea-TSP, MoP-Boric acid @ 50-90-40-8.5 kg $ha^{-1}$. Total Urea, TSP and MoP were applied as basal dose. Boron was applied as boric acid as basal dose and rest amount were applied as foliar application at before flowering stage. The seeds were treated with Autostin® 50 WDG (Carbendazim group) before sowing the seeds to control the seed borne diseases. The seeds were sown in rows in the furrows having a depth of 2-3 cm. Row to Row distance was 30 cm. Irrigation was applied in the experiment field at two times (25 days after sowing and 40 days after sowing). First irrigation was applied at vegetative stage and second irrigation at flowering stage. Data recorded on growth parameters were recorded. The data was analyzed using a computer operated program MSTAT-10 and treatments means were estimated by the estimated by the Duncan Multiple Range Test (DMRT) at 5% level of probability (Gomez and Gomez, 1984).

## Results and Discussion

### Plant height

### Effect of irrigation

The plant height of lentil was highly influenced by irrigation(Figure 1). Resultsshowed that the highest plant height (15.91, 22.38, 25.22 and 24.72 cm at 35, 50, 65 DAS and at harvest respectively) was obtained from $I_2$ (25 DAS and 40 days after sowing) followed by $I_1$ (25 DAS) level of irrigation. Similarly, the shortest plant height (12.84, 19.35, 21.55 and 22.09 cm at 35, 50, 65 DAS and at harvest) was recorded from $I_0$ (no irrigation). Results revealed that plant height increased with increasing irrigation levels irrespective of growing period up to at harvest. Latif (2006), Piri *et al.* (2011) and Hosseini*et al.* (2011) have found similar results when applying two irrigations during branching and pod development stage.

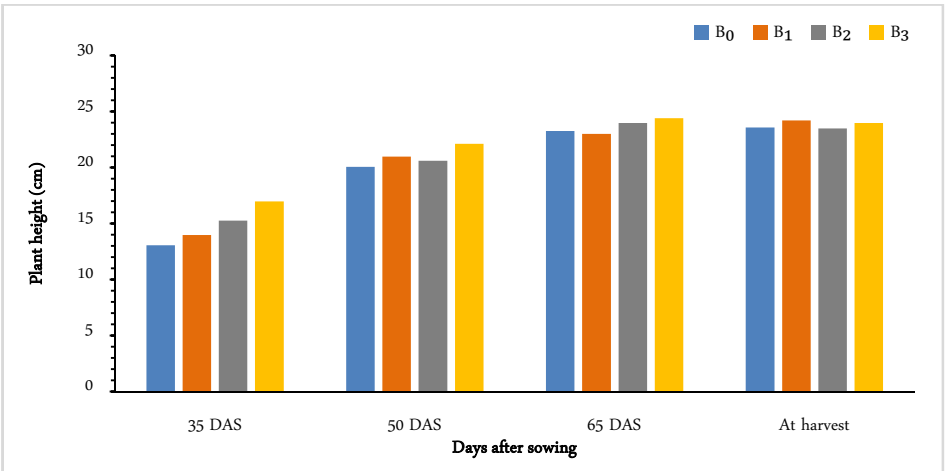



$I_0$ =No irrigation, $I_1$= Irrigation at 25 DAS, $I_2$ = Irrigation at 25 and 40 DAS

Fig.1. Response of irrigation on plant height of lentil at different days aftersowing
(SE =1.0735, 0.6354, 0.5148, 0.503 at 35, 50, 65 DAS and at harvestrespectively).

**Effect of Boron**

Lentil plant height also differed considerably due to different treatments of boron on different days after sowing (Figure2). Result showed that the highest plant height (16.98, 22.12, 24.39 and 23.97 cm at 35, 50, 65 DAS and at harvest, was obtained from $B_3$ (40% recommended dose as basal + rest 60% as flower spray at pre-flowering) followed by $B_2$ (60% RD as basal + rest 40% as FS at PF) and $B_1$ (80% RD as basal + rest 20% as FS at PF) and without boron produced the lowest plant height (13.06, 20.05, 23.24, 23.14 cm at 35, 50, 65 DAS at harvest) respectively was obtained from $B_0$ (control). Comparable results was additionally found by Vimalan *et al*. (2017). It seemed that 1.5 kg B $ha^{-1}$ vastly increased plant height and control ($B_0$) had the lowest quality of plant height in lentil.




$B_0$ = control; $B_1$ = 80% recommended dose as basal + rest 20% as foliar spray at pre-flowering; $B_2$ = 60% RD as basal + rest 40% as FS at PF; $B_3$ = 40% RD as basal + rest 60% as FS at PF

Fig.2. Response of boron on plant height of lentil at different days after sowing
(SE= 0.6906, 0.8538, 0.9341, 0.9525 at 35, 50, 65 DAS and at harvest respectively).

**Interaction effect of irrigation and boron**

Interaction effect of different levels of irrigation and boron application in terms of plant height also exposed significant variation at different days after sowing (Table 1). Result indicated that the highest plant height (19.74, 22.54, 27.02 and 25.59 cm at 35, 50, 65 DAS and at harvest) was recorded from $I_2B_3$. Correspondingly, the lowest plant height (12.71, 19.44, 23.99 and 23.30 cm at 35, 50, 65 days after sowing and control) had the lowest plant height in lentil and at harvest respectively was recorded from $I_0B_0$ which was statistically similar to $I_0B_1$ and $I_0B_2$.

Table 1. Interaction effect ofirrigation and boron on plant height of lentil atdifferent days after sowing

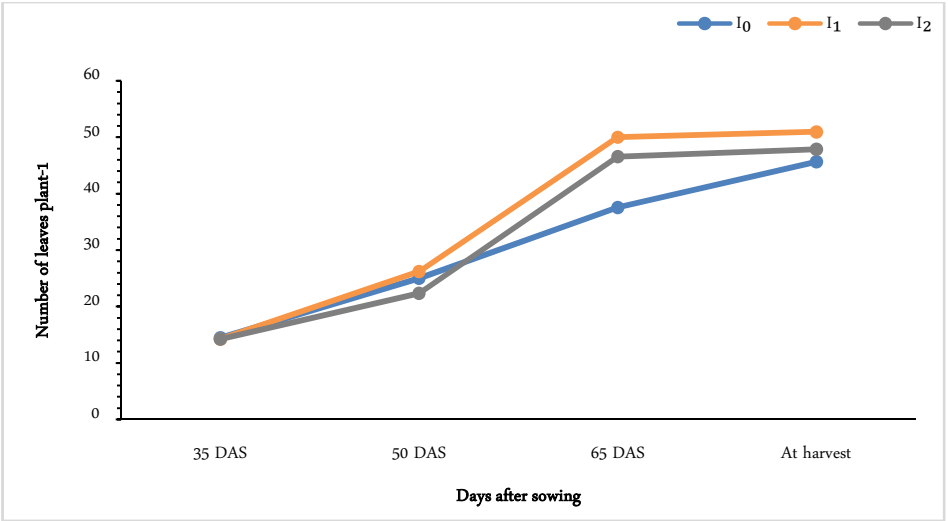
| Treatment combinations | Plant height (cm) at | | | |
|---|---|---|---|---|
| | 35 DAS | 50 DAS | 65 DAS | At Harvest |
| $I_0B_0$ | 12.71 bc | 19.44 ab | 23.99 a-d | 23.30 |
| $I_0B_1$ | 11.53 c | 18.07 b | 19.81d | 21.38 |
| $I_0B_2$ | 13.28 bc | 20.17 ab | 21.12 cd | 21.56 |
| $I_0B_3$ | 13.84 bc | 20.23 ab | 21.28 cd | 22.11 |
| $I_1B_0$ | 14.49 bc | 21.66 ab | 23.54 a-d | 24.50 |
| $I_1B_1$ | 15.31 a-c | 21.35 ab | 24.12 a-d | 25.34 |
| $I_1B_2$ | 15.57a-c | 19.66 ab | 24.26 a-d | 24.40 |
| $I_1B_3$ | 17.37 ab | 21.72 ab | 24.88 a-c | 24.21 |
| $I_2B_0$ | 11.98 c | 19.57 ab | 22.20 b-d | 22.95 |
| $I_2B_1$ | 15.05 bc | 23.45 a | 25.10 a-c | 25.85 |
| $I_2B_2$ | 16.88 ab | 22.10 ab | 26.55 ab | 26.56 |
| $I_2B_3$ | 19.74 a | 22.54 ab | 27.02 a | 27.59 |
| SE | 1.1962 | 1.4789 | 1.6179 | NS |
| CV (%) | 13.98 | 12.3 | 11.85 | 12 |

NS = Non-significant;$I_0$ =No irrigation; $I_1$= 25 DAS; $I_2$ = 25 DAS and 40 DAS,
$B_0$= control; $B_1$= 80% recommended dose as basal + rest 20% as foliar spray at pre-flowering; $B_2$ = 60% RD as basal + rest 40% as FS at PF; $B_3$ = 40% RD as basal + rest 60% as FS at PF

**Number of leaves plant$^{-1}$**

**Effect of irrigation**

The number of leaves plant$^{-1}$differed considerably due to different treatments of irrigations on different days after the planting. (Figure3). The greatest number of leaves plant$^{-1}$ was obtained at different stages of growth (14.23, 24.35, 52.58 and 48.88 at 35, 50, 65 DAS and at harvest) from $I_2$ (25 days after sowing and 40 DAS).The lowest number leaves plant$^{-1}$ (14.44, 24.99, 37.54 and 36.65 at 35, 50, 65 DAS and at harvest) was obtained from $I_0$ (control).

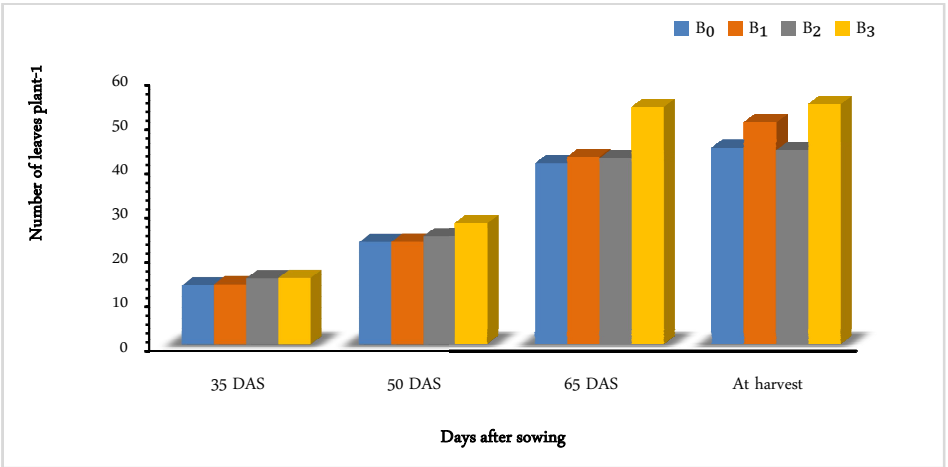



$I_0$ = No irrigation, $I_1$ = 25 DAS, $I_2$ = 25 & 40 DAS

Fig. 3. Response of irrigation on number of leaves plant$^{-1}$ of lentil at different dayafter sowing(SE= 0.3887, 1.3164, 7.9574, 4.475 at 35, 50, 65 DAS and at harvest respectively).

**Effect of born**

Boron had a major effect on the number of leaves plant$^{-1}$ (Figure4). Result showed that the highest number of leaves plant$^{-1}$ (15.08, 27.37, 53.63 and 43.81 at 35, 50, 65 DAS and at harvest respectively) was obtained from $B_3$ (40% recommended dose as basal + rest 60% as foliar spray at pre-flowering) which was statistically different with $B_2$ (60% RD as basal + rest 40% as FS at PF) and $B_1$ (80% RD as basal + rest 20% as FS at PF) and without boron produce the lower number of leaves plant$^{-1}$(13.41, 23.11, 40.89 and 44.43 at 35, 50, 65 DAS and at harvest) was recorded from $B_0$ (control).




$B_0$ = control; $B_1$ = 80% recommended dose as basal + rest 20% as foliar spray at pre-flowering; $B_2$ = 60% RD as basal + rest 40% as FS at PF; $B_3$ = 40% RD as basal + rest 60% as FS at PF

Fig. 4. Response of boron on number of leaves plant$^{-1}$ of lentil at different days after sowing (SE=0.5633, 1.4268, 7.1379, 7.3402 at 35, 50, 65 DAS and at harvest respectively).

**Interaction effect of irrigation and boron**

Interaction effect of different levels of irrigation and boron application in terms of leaves plant$^{-1}$ also exposed significant variation at different days after sowing (Table 2). The highest number of leaves plant$^{-1}$ (45.19, 53.22 and 55.23 at 50, 65 DAS and at harvest) was produced from the interaction of $I_2B_3$. The lowest number of leaves plant$^{-1}$ was produced from the interaction of $I_0B_0$ (control) which was statistically similar with $I_0B_1$, $I_0B_2$, $I_0B_3$, $I_1B_0$, $I_1B_1$ and $I_1B_3$ combinations.

Table 2. Interaction effect of irrigation and boron on the number of leaves plant$^{-1}$ of lentilat different days after sowing

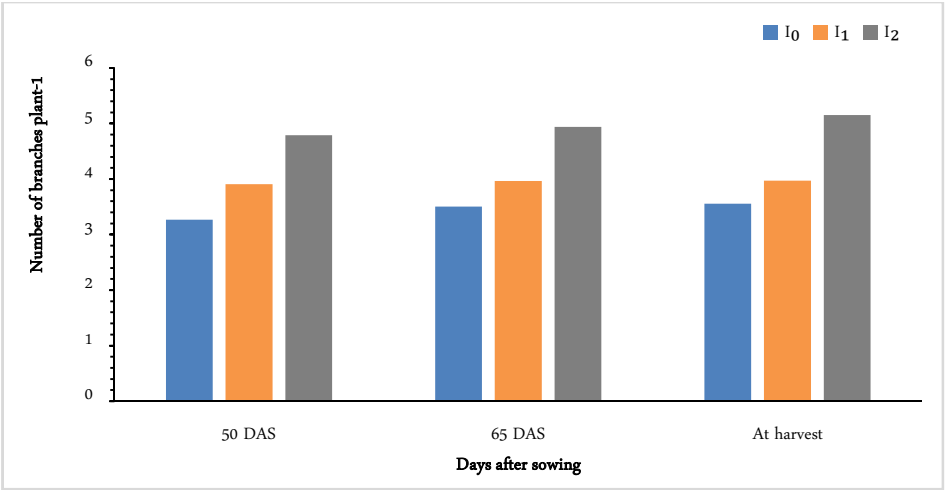
| Treatment combinations | Number of leaves plant$^{-1}$ at | | | |
|---|---|---|---|---|
| | 35 DAS | 50 DAS | 65 DAS | At Harvest |
| $I_0B_0$ | 14.00 | 24.89 c | 34.44 ab | 33.44 |
| $I_0B_1$ | 14.00 | 24.73 c | 36.78 ab | 35.44 |
| $I_0B_2$ | 14.78 | 25.21 c | 34.49 ab | 37.02 |
| $I_0B_3$ | 15.00 | 25.14 bc | 34.67 ab | 35.70 |
| $I_1B_0$ | 13.56 | 24.22 bc | 41.67 ab | 42.33 |
| $I_1B_1$ | 13.70 | 23.22 bc | 43.89 ab | 44.89 |
| $I_1B_2$ | 14.81 | 25.55 ab | 44.44 ab | 49.44 |
| $I_1B_3$ | 14.78 | 31.78 a | 43.00 ab | 40.13 |
| $I_2B_0$ | 12.67 | 20.22 bc | 36.55 ab | 36.52 |
| $I_2B_1$ | 13.33 | 21.45 bc | 32.33 b | 36.14 |
| $I_2B_2$ | 24.43 | 42.56 d | 48.22 ab | 46.96 |
| $I_2B_3$ | 25.46 | 45.19 d | 53.22 ab | 55.23 |
| SE | NS | 2.4713 | 12.363 | NS |
| CV (%) | 15.46 | 11.82 | 13.89 | 12.5 |

NS = Non-significant, $I_0$ =No irrigation; $I_1$= 25 DAS; $I_2$ = 25 DAS and 40 DAS
$B_0$ =control; $B_1$= 80% recommended dose as basal + rest 20% as foliar spray at pre- flowering; $B_2$ = 60% RD as basal + rest 40% as FS at PF; $B_3$ = 40% RD as basal + rest 60% as FS at PF

**Number of branches plant$^{-1}$**

**Effect of irrigation**

From the study it was found that irrigation had great influence on the number of branches per plant in lentil (Figure 5). The highest number of branches per plant (4.79, 4.93 and 5.15 at 50, 65 DAS and at harvest respectively) was recorded from $I_2$ (25 DAS and 40 days after sowing) and the lowest (3.26, 3.05 and 3.55 at 50, 65 DAS and at harvest respectively) was recorded from $I_0$(control). Rahman (1994) also reported that two irrigations gave the highest number branches per plant and the lowest was found in case of without irrigation.

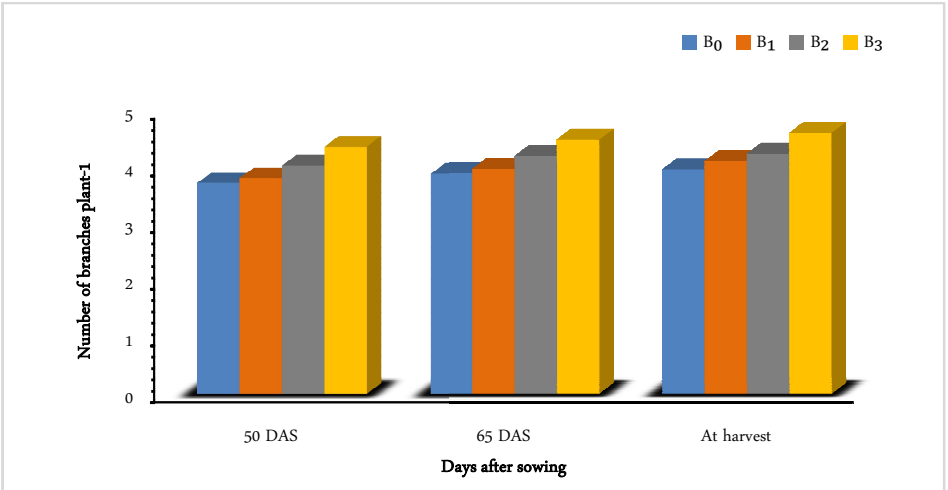



$I_0$ = No irrigation, $I_1$ = 25 DAS, $I_2$ = 25 DAS & 40 DAS

Fig. 5. Response of irrigation on number of branches plant$^{-1}$ of lentil at different days after sowing (SE = 0.2719, 0.127, 0.1085 at 50, 65 DAS and at harvest respectively).

**Effect of boron**

The number of branches per plant of lentil also significantly increased by different levels of boron treatments at different days after sowing (Figure 6). Results exposed that the highest number of branches plant$^{-1}$ (4.37, 4.48, 4.60 at 50, 65 DAS and at harvest) was obtained from $B_3$ (40% recommended dose as basal + 60% as foliar spray at pre-flowering) which was statistically same with $B_2$ (60% RD as basal + rest 40% as FS at PF) at 65 DAS and at harvest. Likewise, the lowest number of branches plant$^{-1}$ (3.72, 3.89, 3.95 at 50, 65 DAS and at harvest separately) was recorded from $B_0$ (control) followed by $B_1$ (80% RD as basal + rest 20% as FS at PF).




$B_0$ = control; $B_1$ = 80% as recommended dose + rest 20% as foliar spray at pre- flowering; $B_2$ = 60% RD as basal + rest 40% as FS at PF; $B_3$ = 40% RD as basal + rest 60% as FS at PF

Fig. 6. Response of boron application on number of branches plant$^{-1}$ of lentil at days after sowing (SE= 0.2385, 0.2527, 0.161 at 50, 65 DAS and at harvest respectively).

**Interaction effect of irrigation and boron**

Interaction effect of different levels of irrigation and boron application on number of branches plant$^{-1}$ also showed significant variation at different days after of sowing (Table 3). Result represented that the highest number of branches plant$^{-1}$ (5.34, 5.45 and 5.74 at 50, 65 DAS and at harvest) was recorded from $I_2B_3$ combination. Correspondingly, the lowest number of branches plant$^{-1}$ (3.12, 3.45 and 3.55 at 50, 65 DAS and at harvest,) was collected from $I_0B_0$ treatment combination which was statistically similar with $I_0B_1$ and $I_0B_2$ followed by $I_0B_3$,$I_1B_0$ and $I_1B_1$.

Table 3. Interaction effect of irrigation and boron on the number of branches plant$^{-1}$ of lentil at different days after sowing

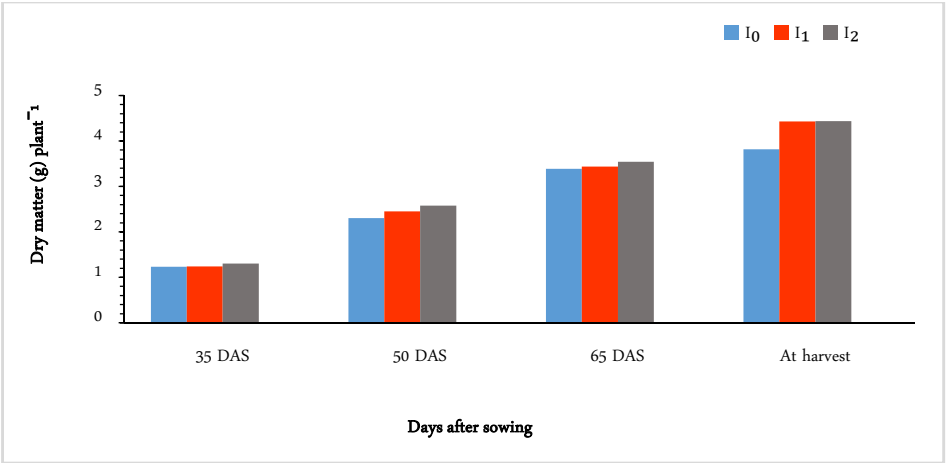
| Treatment combinations | Number of branches plant$^{-1}$ at | | |
|---|---|---|---|
| | 50 DAS | 65 DAS | At Harvest |
| $I_0B_0$ | 3.11 c | 3.45 d | 3.55e |
| $I_0B_1$ | 3.16 c | 3.47 cd | 3.55 e |
| $I_0B_2$ | 3.33 c | 3.54 cd | 3.55 e |
| $I_0B_3$ | 3.45 bc | 3.55 cd | 3.56 e |
| $I_1B_0$ | 3.68 bc | 3.69 cd | 3.70 de |
| $I_1B_1$ | 3.72 bc | 3.74 cd | 3.79 de |
| $I_1B_2$ | 3.89 a-c | 3.98 b-d | 3.87 c-e |
| $I_1B_3$ | 4.32 a-c | 4.45 a-d | 4.51 b-d |
| $I_2B_0$ | 4.37 a-c | 4.54 a-d | 4.62 bc |
| $I_2B_1$ | 4.56 a-c | 4.69 a-c | 4.97 ab |
| $I_2B_2$ | 4.89 ab | 5.06 ab | 5.29 ab |
| $I_2B_3$ | 5.33 a | 5.45 a | 5.73 a |
| SE | 0.4131 | 0.4378 | 0.2789 |
| CV (%) | 17.94 | 18.33 | 11.43 |

NS = Non-significant, $I_0$ =No irrigation; $I_1$= 25 DAS; $I_2$ = 25 DAS and 40 DAS
$B_0$ =Control; $B_1$= 80% recommended dose as basal + rest 20% as foliar spray at pre-flowering; $B_2$ = 60% RD as basal + rest 40% as FS at PF; $B_3$ = 40% RD as basal + rest 60% as FS at PF

**Dry matter plant$^{-1}$**

**Effect of irrigation**

In case of irrigation, major variability was observed in total dry matter (Figure 7). The figure indicated that plant dry matter increased with advancement of growth stage irrespective of irrigation levels. It can be concluded from the figure that two irrigations ($I_1$ and $I_2$) produced the maximum amount of plant dry matter (1.30, 2.58, 3.54 and 4.44 g at 35, 50, 60 DAS and at harvest) and control ($I_0$) showed the minimum (1.23, 2.30, 3.39 and 3.82 g at 35, 50, 60 DAS and at harvest) for sampling dates of 25 DAS and 40 days after sowing. A similar result was founded by Latif (2006), wherewith two irrigations he found more dry matter plant$^{-1}$ on mustard than with one irrigation.

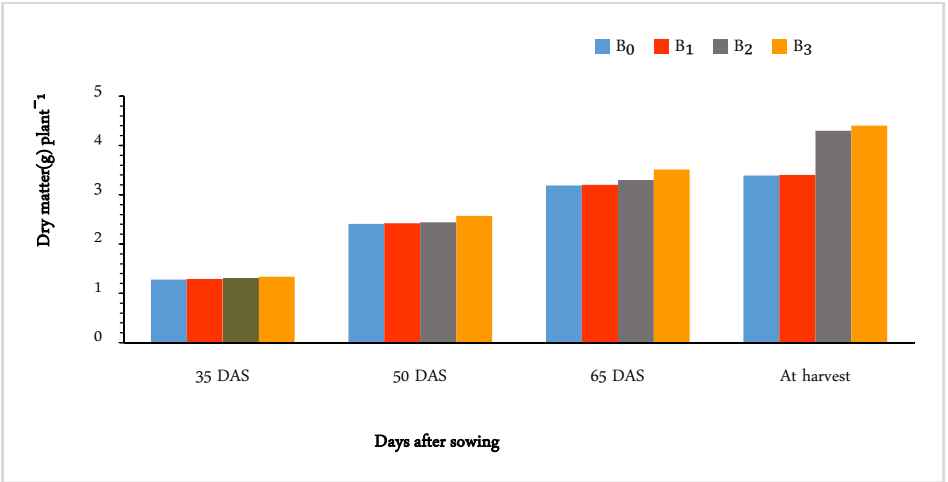



NS = Non-significant, $I_0$ = No irrigation; $I_1$ = 25 DAS; $I_2$ = 25 DAS and 40 DAS

Fig. 7. Response of irrigation application on dry matter (g) plant$^{-1}$ of lentil atdifferent days after sowing (SE= 0.0508, 0.056, 0.4946, 0.4956 at 35, 50, 65 DAS and at harvest respectively).

**Effect of boron**

In all the durations observed, substantial variability in plant dry matter was found due to boron (Figure 8). The figure showed that plant dry matter weight showed an increasing trend with advances of time for all boron levels. The rate of increase was found slow up to 35 DAS after that dry weight increased up to harvest irrespective of boron levels. The figure showed that $B_3$ (40% recommended dose as basal + Rest 60% as FS at PF) had produced the highest dry matter weight (1.34, 2.57, 3.51and 4.40 g at 35, 50, 65 DAS and at harvest) and Control ($B_0$) showed that the lowest (1.28, 2.41, 3.19 and 3.39 g at 35, 50, 65 DAS and at harvest) respectively.




$B_0$ = control; $B_1$ = 80% as recommended dose + rest 20% as foliar spray at pre- flowering; $B_2$ = 60% RD as basal +rest 40% as FS at PF; $B_3$ = 40% RD as basal + rest 60% as FS at PF

Fig. 8. Response of boron application on dry matter (g) plant$^{-1}$ of lentil at different days aftersowing (SE = at 1.030, 1.039, 1.038, 1.469 35, 50, 65 DAS and at harvest respectively).

**Interaction effect of irrigation and boron**

It revealed from (Table 4) that the combined effect of two levels of irrigation at (25 and 40 days after sowing) with boron at (40% recommended dose as basal + rest 60% as foliar spray at pre-flowering) gave the significant highest dry matter per plant at all growth stages. The results revealed that the vast plant dry matter (4.77 g) was found from $I_2B_3$ at harvest which was statistically identical with $I_2B_2$, $I_2B_1$, $I_1B_2$, $I_1B_3$ and $I_1B_2$ (at 50, 65 DAS and at harvest). The lowest dry matter (1.30, 2.26, 2.72 and 3.51 g at 35, 50, 65 DAS and at harvest) was found from $I_0B_0$(control).

Table 4. Interaction effect of different levels of irrigation and boron on dry matter of lentil at different days after sowing

| Treatment combinations | Dry weight (g) plant$^{-1}$ at | | | |
|---|---|---|---|---|
| | 35 DAS | 50 DAS | 65 DAS | At Harvest |
| $I_0B_0$ | 1.30 | 2.26 | 2.72 ab | 3.51 |
| $I_0B_1$ | 1.30 | 2.25 | 3.13 b | 3.54 |
| $I_0B_2$ | 1.29 | 2.25 | 3.16 b | 2.97 |
| $I_0B_3$ | 1.28 | 2.26 | 3.18 b | 3.25 |
| $I_1B_0$ | 1.22 | 2.27 | 3.26 ab | 3.78 |
| $I_1B_1$ | 1.29 | 2.25 | 3.33 ab | 4.84 |
| $I_1B_2$ | 1.37 | 2.31 | 3.34 ab | 3.62 |
| $I_1B_3$ | 1.39 | 2.32 | 3.38 ab | 3.63 |
| $I_2B_0$ | 1.31 | 2.32 | 4.45 ab | 3.27 |
| $I_2B_1$ | 1.28 | 2.36 | 4.36 ab | 4.74 |
| $I_2B_2$ | 1.30 | 2.38 | 3.73 ab | 4.75 |
| $I_2B_3$ | 1.31 | 2.41 | 4.21 ab | 4.77 |
| SE | NS | NS | 0.6709 | NS |
| CV (%) | 13.63 | 17.76 | 15.45 | 16.31 |

NS = Non-significant, $I_0$ =No irrigation; $I_1$= 25 DAS; $I_2$ = 25 DAS and 40 DAS

$B_0$ =control; $B_1$= 80% recommended dose as basal + rest 20% as foliar spray at pre-flowering; $B_2$ = 60% RD as basal + rest 40% as FS at PF; $B_3$ = 40% RD as basal + rest 60% as FS at PF

**Interaction effect of irrigation and boron on days to flowering and days to maturity**

Days to flowering of lentil showed substantial variability due to different levels irrigation and boron treatment. The highest days to flowering (56 days) was recorded from $I_0B_2$ treatment, while the lowest (52 days) was recorded from $I_1B_1$ (Table 5). Statistically significant differences were found for days to pod maturity of lentil due to different levels of irrigation and boron treatment. The maximum days to pod maturity (94 days) was recorded from $I_2B_3$, which was statistically similar to $I_2B_2$, $I_2B_1$, $I_1B_1$, $I_2B_1$ and $I_2B_3$. The minimum days to pod maturity (88 days) was recorded from $I_0B_0$, which was statistically similar to $I_0B_1$, $I_0B_2$ and $I_0B_3$, respectively.

Table 5. Interaction effect of irrigation and boron on days to flowering and daysto maturity of lentil at different days after sowing

| Treatment combinations | Days to flowering | Days to maturity |
|---|---|---|
| $I_0B_0$ | 55.78 ab | 88.99 d |
| $I_0B_1$ | 55.12 a-c | 89.37 d |
| $I_0B_2$ | 56.18 a | 89.89 cd |
| $I_0B_3$ | 55.77 ab | 89.85 cd |
| $I_1B_0$ | 53.51 a-c | 91.22 b-d |
| $I_1B_1$ | 52.52 c | 92.43 a-c |
| $I_1B_2$ | 52.91 bc | 94.00 a |
| $I_1B_3$ | 53.24 a-c | 93.87 a |
| $I_2B_0$ | 54.04 a-c | 94.10 a |
| $I_2B_1$ | 53.35 a-c | 93.91 a |
| $I_2B_2$ | 53.40 a-c | 93.77 ab |
| $I_2B_3$ | 54.13 a-c | 94.32 a |
| SE | 0.538 | 0.7112 |
| CV (%) | 1.72 | 1.34 |

NS = Non-significant, $I_0$ =No irrigation; $I_1$= 25 DAS; $I_2$ = 25 DAS and 40 DAS

$B_0$ =control; $B_1$= 80% recommended dose as basal + rest 20% as foliar spray at pre-flowering; $B_2$ = 60% RD as basal + rest 40% as FS at PF; $B_3$ = 40% RD as basal + rest 60% as FS at PF

## Conclusion

In conclusion,it was observed that the combined effect of irrigation and boron levels had influenced growth factors including plant length (cm), number of leaves plant$^{-1}$, number of branches plant$^{-1}$, dry matter (g) content of lentils. In this study, irrigation for two times at 25 and 40 days after sowing and boron at 40% basal along with 60% as foliar spray at pre-floweringhave shown better outcome on lentil production. This recommended combination of irrigation and boron application could be utilized as an effective method for increasing growth and production of lentil.

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