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EFFECT OF SEED STALK PRUNING AND BORON APPLICATION ON THE SEED YIELD OF SUMMER ONION (*Allium cepa* L.) IN THE HIGH BARIND TRACT

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Abstract

The experiment was carried out at FSRD site, Kadamshahar, Godagari, Rajshahi during 2009-10 and 2010-11 to find out the number of seed stalk and optimum boron dose for seed production of summer onion in High Barind Tract (AEZ 26). The treatments comprised three levels of seed stalk (0, 4, and 6) and three rates of boron application (0, 1, and 2 kg/ha). It revealed that the seed stalks and boron either in single or combination had significant effect on the yield and yield contributing characters of onion seed. The combination comprising 4 stalks with 2 kg B/ha and 6 stalks with 1 kg B/ha were found to be the best choice for achieving higher seed yield of onion. The highest seeded fruit/umbel (4.06 and 4.55) and seed yield (669 and 713 kg/ha) were recorded from 6 stalks/plant fertilized with 1 kg boron/ha which was statistically identical to 6 stalks/plant fertilized with 2 kg boron/ha and 4 stalks/plant with 2 kg/ha boron in the High Barind Tract.

Keywords: Seed stalk pruning, boron application, summer onion, high Barind tract.

Introduction

Onion (*Allium cepa* L.) is one of the most important spice crops in Bangladesh. Among the spice crops, it ranks first with an annual production of 589 thousand metric tons which is very low compared to the estimated annual requirement of about 836 thousand metric tons (Krishi Dairy, 2007). Seed has a unique role to increase onion production. Onion is an important spice crop in Bangladesh. It ranks first in production (889000 MT) and second in area (125101 ha) among the spices (BBS, 2008). It covers almost 36% of the total areas under spices. The mean yield of onion in Bangladesh is very low (4 t/ha) compared to world average of 17.27 t/ha (FAO, 1998). Annually Bangladesh produced only 150 metric tons of onion seed as against the requirement of 300 metric tons (Rahim *et al.*, 1993). Therefore, a great scarcity of onion seed is noticed every year. Improved seed contributes substantially to enhance crop yield as high as 30% (Shaikh *et al*., 2007) On the other hand, Barind Tract is a potential area for

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quality seed production of its inherent environmental condition, usually less humid condition prevails throughout the whole rabi season and so comparatively less pest infestation is observed during that time. That is why, onion seed production in High Barind Tract is increasing day by day. Different studies revealed that boron application and number of seed stalks are two important key factors for quality seed production. Brewster (1994) observed various differences in average seed yield as it depends on genotype, locality, season, and method of seed production. According to Thompson (1979), high quality seed is critical input on which all other inputs will depend for their full effectiveness. In onion, several studies revealed that number of seed stalks is important factor for the seed yield and quality. On the other hand, boron is essential for seed setting and formation as well as seed vigour and viability in onion and so, its deficiency may be the reason of floral sterility. Therefore, considering prerequisite, the present study was undertaken to find out the keeping number of seed stalks and optimum boron dose for seed production of summer onion in High Barind Tract.

Materials and Method

The experiment was conducted at Farming System Research and Development (FSRD) site, Kadamshahar, Godagari, Rajshahi for two consecutive years (2009-10 and 2010-11). The soil of the experimental plots belongs to Amnura series under AEZ 26. Before starting the experiment, composite soil sample (0-15 cm) was collected and analyzed in the laboratory. The soil had following characteristics, such as pH 5.5, OM 0.98%, basal N 0.06%, available P 9.36 mg/g, K 0.26 meq/100g soil, S 14.51 mg/g, Zn 1.05 mg/g, and B 0.19 mg/g. The treatments comprised three levels of seed stalk (0, 4, and 6) with three doses of boron application (0, 1, and 2 kg/ha). The experiment was laid out in a factorial randomized complete block design with three replications. Onion variety BARI Piaz-5 was used in the study. The unit plot size was 2 m × 3 m. The bulbs were transplanted at the spacing of 25 cm x 20 cm during 1st week of November 2009 and 2010. The soil of experimental plot was treated by Furadan 5G @ 7.5 kg/ha before transplanting the bulbs. Rovral (@ 2 g/L water) and Bavistin (1 g/L water) were used simultaneously at 8-10 days intervals during vegetative stage. The plot was irrigated 7 times at 7-10 day intervals before seed maturity. Other operations viz., mulching and weeding were done in order to support normal plant growth. The crop was harvested at maturity during 10 to 15 April 2010 and 2011. Observations were made on yield components from 10 randomly selected plants per plot. Yield data was taken as plot-wise and thereafter converted into kg/ha. The data were analyzed statistically and the mean differences were adjudged by Duncan's Multiple Range Test (Gomez and Gomez, 1984).

Effect of seed stalk

Both the years, significant variation was observed in seed yield and yield attributes of onion with the variation of number of seed stalks (Table 1). In 2009-2010, the maximum number of seeded fruits/umbel (303.24) and seed weight/umbel (3.95 g) were noted from keeping 4 stalks/plant. But in 2010-2011, maximum number of seeded fruits/umbel (297.0) and seed weight/umbel (3.85 g) were noted from keeping 6 stalks/plant. Both the years, maximum number of seeds/umbel (690 and 703.7) and 1000-seed weight (3.62 g and 3.29g) were also found from 4 seed stalks/plant, which was followed by 6 seed stalks/plant but minimum values were documented in no seed stalk pruning. In case of seed yield, maximum seed yield (643.66 kg/ha and 670.2 kg/ha) was produced in 6 seed stalks/plant. Morozowska *et al*. (2009) showed a significant influence on the bulb size, the number of seed stalks and the inflorescence diameter. Tall seed stalks easily fall down, which causes losses in seed yield (Rudolph, 1988).

Table 1 Seed yield and yield attributes of summer onion as affected by number of stalks at FSRD site Kadamshahar, Rajshahi during the year of 2009-10 and 2010-11.

No. of stalk	Seeded fruits/ umbel		Seed wt/ umbel (g)		No. of seeds/ umbel		1000-seed wt (g)		Seed yield (kg/ha)	
	2009-10	2010-11	2009-10	2010-11	2009-10	2010-11	2009-10	2010-11	2009-10	2010-11
4	303.24a	254.4b	3.95a	3.31b	690.11a	703.7a	3.62a	3.29a	571b	626b
6	293.65b	297.0a	3.76a	3.85a	670.11b	700.6a	3.61a	3.17a	644a	670a
No pruning	277.43c	242.0b	3.3b	3.92a	621.77c	613.5b	2.95b	2.88b	599ab	561c
CV (%)	2.90	10.68	10.01	9.02	1.82	5.47	4.80	7.01	9.75	4.55

Effects of boron levels

Significant variation was observed in seed yield and yield attributes of onion among three boron levels (Table 2). In 2009-2010, the maximum number of seeded fruits/umbel (307) and seed weight/umbel (3.94 g) were observed from 2 kg B/ha. The maximum number of seeds/umbel (679) and 1000-seed weight (3.70 g) were also found from 2 kg B/ha followed by 1 kg B/ha treatment. In 2010-2011, maximum number of seeded fruits/umbel (283.2) and seed weight/umbel (4.17 g) were found from 1 kg boron/ha. Significantly higher number of seeds/umbel (688.3) and 1000-seed weight (3.58 g) were also found from 1 kg boron/ha followed by 2 kg boron/ha treatment. But in both the years, minimum was found in control plot. In case of seed yield, the maximum seed yield (640.22 kg/ha and 655.9) was produced from 2 kg B/ha treated plot, which was followed by 1 kg B/ha treated plot but minimum in control plot. Phosphorus,

potassium, and boron application had a positive effect on the productivity of onion (Howlader *et al*., 2012). According to Robinowitc *et al*. (2002) showed that foliar sprays of boron improved onion yields of the two consecutive seasons.

Table 2. Seed yield and yield attributes of summer onion as affected by different levels of boron at FSRD site, Kadamshahar, Rajshahi during the year of 2009-10 and 2010-11.

Boron levels (kg/ha)	Seeded fruits/umbel		Seed wt/ umbel g)		No. of seeds/ umbel		1000-seed wt (g)		Seed yield (kg/ha)	
	2009-10	2010-11	2009-10	2010-11	2009-10	2010-11	2009-10	2010-11	2009-10	2010-11
0	277.55c	261.3ab	3.16b	3.06b	638.33c	645.1b	3.007b	2.65c	562ab	553.6b
1	289.62b	283.2a	3.90a	4.17a	664.00b	688.3a	3.58ab	3.58a	612ab	647.6a
2	307.20a	248.4b	3.94a	3.85a	679.67a	684.5a	3.70a	3.41ab	640a	655.9a
CV (%)	2.90	10.68	10.01	9.02	1.82	5.47	4.8	7.01	9.75	4.55

Table 3. Seed yield and yield attributes of summer onion as affected by different numbers of stalk and boron levels at FSRD site, Kadamshahar, Rajshahi during the year of 2009-10 and 2010-11.

Boron × Stalk		Seeded fruits/umbel		Seed wt/umbel (g)		No. of seeds/ umbel		1000-Seed wt (g)		Seed yield (kg/ha)	
S_1	B_0	287.20cd	277.3abc	2.78c	2.81f	669.33b	672.3abc	3.08b	2.80def	495.33c	533.4d
	B_1	317.61a	238.6cd	3.48ab	3.57cde	688.66b	720.2ab	3.91a	4.03a	585.66ab	645.1b
	B_2	299.88bc	247.4bcd	3.62ab	3.55cde	712.33a	718.5ab	3.88a	3.05cd	654.00a	698.2a
S_2	B_0	283.67d	296.8b	3.08bc	3.13ef	644.66c	657.2bcd	3.15b	2.68ef	503.00b	596.3c
	B_1	312.77ab	312.8a	4.06a	4.55a	695.66ab	707.3ab	3.69a	3.54b	669.17a	712.9a
	B_2	289.68cd	281.2abc	4.12a	3.86bcd	698.00ab	737.4a	3.99a	3.29bc	649.00a	701.5a
S_3	B_0	261.77e	209.9d	3.62ab	3.25def	601.00d	597.4d	2.79c	2.47f	496.36c	531.1d
	B_1	291.22cd	298.3ab	4.11a	4.39ab	627.66c	637.4cd	3.14b	3.18bcd	564.00b	584.8c
	B_2	289.28d	217.8d	4.14a	4.13abc	636.66c	605.8cd	3.23b	3.99cde	562.00b	567.9cd
CV (%)		2.90	10.68	10.01	9.02	1.82	5.47	4.80	7.01	9.75	4.55

S_1= 4, S_2= 6, S_3= No pruning, B_0= 0, B_1= 1, B_2= 2 kg/ha

Interaction effects of seed stalk and boron levels

Interaction effect of seed stalk and boron levels had significant effect on seed yield and yield attributes of onion (Table 3). In 2009-2010, the maximum number of seeded fruits/umbel (317) and 1000-seed weight (3.91 g) were found from 4 stalks/plant fertilized with 1 kg B/ha which were statistically similar with 6

stalks/plant fertilized with same dose. Higher number of seeds/umbel (712) was found from 4 stalks/plant with 2 kg B/ha, which was identical to 6 stalks/plant fertilized with 1 kg B/ha but the minimum (601) in control plot. In 2010-2011, significantly maximum number of seeded fruits/umbel (297.0) was found from keeping 6 stalks/plant, and maximum seed weight/umbel (3.85 g) was observed from keeping 6 stalks/plant which was statistically similar to no pruning treatment. Both the years, maximum seed yield (712.9 kg/ha and 669.17 kg/ha) was produced from 6 stalks/plant fertilized with 1 kg boron/ha which, was statistically identical to 4 stalks/plant fertilized with 2 kg boron/ha and 6 stalks/plant with same dose of boron. This might be due to higher number of seeds/umbel and 1000-seed weight produced from 4 and 6 stalks/plant fertilized with 1 and 2 kg boron/ha. But the minimum seed yield (495.33 and 533.40 kg/ha) was found from 4 stalks/plant fertilized with boron control plot. These results are in agreement with the results of Mehrotra *et al.* (1977) who reported that boron influences seed yield of oil seed and spices crops.

Conclusion

From two years' observation, it is revealed that seed stalk and boron both either in single or in combination had significant effect on yield of onion seeds. The maximum seed yield of summer onion was produced keeping 6 stalks/plant fertilized with 1 kg boron/ha which was statistically identical to 6 stalks/plant fertilized with 2 kg boron/ha and keeping 4 stalks/plant with 2 kg boron/ha in the High Barind Tract (AEZ 26).

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