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Effect of planting time on quality seed production of onion in high Barind tract

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Abstract

A field experiment was conducted in the farmer's field of FSRD site, Kadamshahar,Godagari, Rajshahi during Rabi2017-18 and 2016-17 to select suitable planting time for onion true seed production in High Barind Tract. The experiment was laid out in a randomized complete block design with three replications. The treatments were five planting dates viz. 20 October, 30 October, 10 November, 20 November and 30 November to achieve the objective. The results revealed that the growth parameters, seed yield components, health and quality of harvested seeds were significantly influenced by the different treatments. Maximum seed yield was obtained from T_4 (1.01 t ha^{-1} and 0.71 t ha^{-1}respectively) when planting was done on the 20 November during the both seasons. In a similar way it was the lowest T_1 (0.54t ha^{-1} and 0.71 t ha^{-1} respectively) on 20 October planting. Results showed that among the different planting dates, 20th November was the best for quality and seed yield.

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Introduction

Onion (*Allium cepa*L.) is one of the most important spice crops of Bangladesh. This is mostly used as condiment and possesses tremendous popularity as well as economic importance all over the world. It is currently grown in at least 175 countries worldwide. Among the countries, China, India, United States, Turkey, Pakistan, Russia, South Korea, Japan, Egypt, and Spain are the largest producers. In Bangladesh, it is commercially cultivated in the greater districts of Faridpur, Rajbari, Kushtia, Meherpur, Jhenaidah Rajshahi, Manikgonj, Comilla, Madaripur, Jessore, Gopalganj, Rangpur, and Pabna (BBS, 2015). Onion is used as a delicious vegetables and it is very common in almost all food preparations (Hossain and Islam, 1994). People consume onion daily as salad and pickle, as boiled, fried and baked condition as well as in curries (Pandita, 1994). But its seed production is difficult due to climatic condition. In most cases early hail-storm and shower damages onion seed stalk in the field resulted to acute crisis of onion seed. Barind Tract is different from other parts of the country due to its undulating topography consequently well drainage system. The region experienced dry and hot temperature with low and erratic rainfall. This climatic condition is favorable for onion seed production. For this reason, huge area of land is cultivated for onion seed production. But farmers do not know the suitable planting time of onion for seed production. Hence the trial has been undertaken to find out the suitable planting time for onion seed production in farmers field condition. Onion is grown in about 419122 acres of land, average yield per acre is 4.067ton and the annual production is 17,04,402 m tons of onion bulbs (BBS, 2015).

It completes vegetative phase with bulb production in the first year. The bulbs are used as planting material for production of true seed in the second year. The demands of quality true seeds are increasing day by day. The price of true seeds is also high. The seeds available in the market are poor in quality. The total production of onion seed in Bangladesh is about 150 tons/year but the requirement is more than 900 tons (BBS, 2009). Climatic condition of Bangladesh is not suitable for the production of true seed by seeds to seed method (Rashid, 1976). Onion is a thermo and photosensitive crop (Brewster, 1994). The optimum temperature for onion cultivation is 13-14°C (Rashid, 1983).

In Bangladesh, onion seeds are produced during winter period (Rabi season). Foggy weather at early stage of crop growth and early rain at the flowering stage adversely affect the seed crop. The north-western heavy wind almost may lead to partial or total damage of the seed crop. Thus, the time of planting of bulbs for true seed production in a particular area need to be determined for quality true seed production of onion (Anonymous. 2010).

Planting date may vary in different localities as well as agro ecological zones and even from year to year at the same place. The environmental conditions greatly influence growth and development of onion plant. Different growth phases of onion have different environmental requirements (Rashid, 1983). Keeping all these above facts in view, the present study was undertaken with the following objective: To determine the appropriate planting date on the yield and quality of true onion seeds.

Materials and methods

The field experiment was conducted at Kadamshahar under FRSD site, Godagari, Rajshahi during *rabi*2017-18 and 2016-17. The experiment was laid out in a randomized complete block design with three replications. The unit plot size was 6m x 5 m. BARI Piaj-1 was used in the research program.

The bulbs were sown in 50 cm row to row distance and bulbs to bulbs 10 cm. Dates of planting were the treatments of the experiments. The treatments were T_1: 20 October T_2: 30 October, T_3: 10 November T_4: 20 November, T_5: 30 November**.** Onion bulbs were sown on those different planting dates in both years (2017 and 2016 respectively). The crop was fertilized with recommended doses of fertilizers and manure at the rate of 110-44-125-20 kg N-P-K-S ha^{-1}+ cow dung 07 t ha^{-1} following FRG, 2012(BARC 2012).Full doses

of cow dung, one third of the urea, half of the MoP and all other inorganic fertilizers were applied according to individual plot and mixed with soil at the time of final land preparation. Rest of the Urea was applied in two equal installments at 20 and 30 days after planting. Rest of the MoP was applied at 30 days after planting. Intercultural operations viz. weeding and plant protection measures against insect and diseases were taken as required. To control purple blotch of onion rovral@2gm per litter was sprayed. Irrigation was provided in this experiment as and when necessary. Excess water was drained out properly. Onion was harvested on 10-17 April 2018 and 05-12 April 2017respectively. Data were collected on seed yield and different seed yield components and analyzed statistically with open source software R (R Core Team, 2017).

Results and discussion

The performance of seed yield and seed yield parameters of onion was presented in Table-1 (2017-18) and Table-3 (2016-17). The seed yield and seed yield contributing characters like plant ht (cm), no. of umbel plant^{-1}, umbel breath (cm),no. of seeds umbell^{-1},seed wt umbel^{-1}(g)and TGW(g) showed significant variation during the both seasons. Plant height was significantly influenced by the planting dates.

Table 1. Effect of planting dates on seed yield parameters of Onionin HBT during Rabi season 2017-18.

Treatment	Plant height (cm)	No. of Umbel plant^{-1}	Umbel diameter (cm)	Seeds umbel^{-1}	Seedwt umbel^{-1}(g)	1000-seed wt(g)	Seed yield (t/h)
T_1	77.73 d	2.80 d	10.27 e	383 e	1.18 e	3.10 d	0.54 d
T_2	82.27 c	3.13 c	13.53 d	479 d	1.65 d	3.51c	0.60 cd
T_3	88.43 b	3.93 b	14.67 c	578 c	2.25 c	3.84 b	0.66 c
T_4	93.60 a	4.60 a	16.13 a	754 a	3.67 a	4.17 a	1.01 a
T_5	95.10 a	4.1 b	15.33 b	655 b	2.84 b	4.06 b	0.88 b
LSD	3.38	0.32	0.66	18.63	0.14	0.23	0.080
CV (%)	2.05	372	13.99	1.74	3.17	3.026	5.45

The tallest plant height was recorded in T_5 (106.83 cm) in the season 2016-17 than in 2017-18, T_5 (95.01 cm). The shortest plant height (77.73 cm) was obtained from T_1 during 2017-18 and in the previous year also T_1 (88.9 cm) showed lowest plant height. On the other hand the highest number of umbel plant^{-1} was recorded in T_4 (4.60) and the lowest umbel plant^{-1} was T_1 (2.80) in the 2nd year whereas the first year showed similar results.

The highest umbel breath (16.13cm) was found in T_4 (planting date 20 November) which are significantly different from other treatments during 2017-18 and in the previous year T_4 (17.00) showed highest result.

Table 2. Effect of planting dates on seeds health and quality of BARI Piaj-1during Rabi season 2017-18.

Treatment	Moisture (%)	Germination (%)
T_1	9.46	42c
T_2	9.57	44c
T_3	9.00	75b
T_4	9.05	85a
T_5	9.50	74b
$LSD_{(0.05)}$	NS	4.43
CV(%)	6.91	3.15

T_1= 20 October, T_2= 30 October, T_3= 10 November, T_4= 20 November and T_5= 30 November.

In the year of 2017-18 and 2016-17 the maximum number of seeds umbel^{-1} was recorded in T_4 (754, 859 respectively) and the minimum was obtained from T_1 (383,320 respectively). In the 2nd year, seed weight umbel^{-1}(g) was found in T_4 (3.67g) which are significantly higher than other treatments and the lowest was T_1 (1.18 g) and first year result also showed the maximum seed weight umbel^{-1}(g) in T_4 (3.09 g)

and the minimum was obtained from T_1(1.06 g) . In the both season the highest 1000 seed weight (4.17g, 4.10 g respectively) was found in T_4 and followed by T_5 (4.06 g, 3.68 g respectively) and the lowest 1000 seed weight (3.10g, 2.78g respectively) was recorded in T_1 (planting date 20 October). Seed yield was significantly influenced by the planting dates. Maximum seed yield was 1.01 t ha^{-1} and 0.71 t ha^{-1} when planting was done on the 20 November during both seasons. In a similar way it was the lowest (0.54t ha^{-1} and 0.71 t ha^{-1} respectively) on 20 October planting and T_2, T_3 and T_5 were identical in seed yield.

Table 3. Effect of planting dates on seed yield parameters of Onion in HBT during Rabi season 2016-17.

Treatments	Plant height	No. Umbel $plant^{-1}$	Umbel breath (cm)	Seeds $Umbel^{-1}$(no)	Seed weight $Umbel^{-1}$(g)	1000 Seed weight (g)	Seed Yield (t ha^{-1})
T_1	88.9d	2.73d	11.6d	320.00d	1.06d	2.78d	0.44c
T_2	95.96c	3.67c	14.13c	584.00c	2.35c	3.29c	0.61b
T_3	101.07b	4.27b	15.4b	722.67b	2.65b	3.86ab	0.68ab
T_4	106.00a	4.6a	17.00a	859.33a	3.09a	4.10a	0.71a
T_5	106.83a	4.13b	14.80bc	660.00bc	2.44bc	3.68ab	0.62b
$LSD_{(0.05)}$	4.12	0.27	1.12	112.42	0.29	0.25	0.08
CV(%)	2.19	3.76	4.08	9.48	6.71	3.76	7.13

The seeds were harvested from the plants sown at different dates and subjected to quality test.

The moisture content of the seeds of all the treatments were similar and there were no significant differences in 2017-18(Table 2) and in 2016-17 (Table 4). But there were significant differences in seed germination in both seasons. Maximum germination (86%, 85% respectively) was recorded in T_4 followed by T_3 (76%) and T_5 (74%) and alike lower germination was recorded in T_1 (42% and 43%) during 2017-18 and 2016-17 season.

Table 4. Effect of planting dates on seeds health and quality of BARI Piaj-1 during Rabi season 2016-17.

Treatment	Moisture (%)	Germination (%)
T_1	8.46	43 c
T_2	8.51	45 c
T_3	8.25	76 b
T_4	8.25	86 a
T_5	8.48	74 b
$LSD_{(0.05)}$	NS	4.34
CV(%)	7.07	3.09

T_1= 20 October, T_2= 30 October, T_3= 10 November, T_4= 20 November and T_5= 30 November.

Farmer's reaction

Farmers of High Barind Tract are cordially accepted the technology and also chose 20 November, the suitable planting time for the yield and quality of true onion seeds production.

Conclusion

Based on the results, it can be concluded that among the different planting dates, 20 November was the best for quality and seed yield but considering the 2nd highest results it may be recommended that 10-20 November is the optimum planting time for the yield and quality of true onion seeds production in High Barind condition.

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