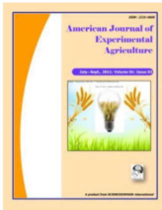

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Direct Seeded and Transplanted Maize: Effects of Planting Date and Age of Seedling on the Yield and Yield Attributes

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

An experiment was conducted at the Bangladesh Agricultural Research Institute, Regional Station, Jamalpur, Bangladesh during rabi (winter) 2003-2004 to study the performance of maize varieties at different planting dates and ages of seedling. The experiment site is located at 24°56'11'' N latitude and 89°55'54'' E longitude and at an altitude of 16.46 m. The duration of the study period was November 2003 to May 2004. Design of the experiment was split-split plot having 3 (three) replications assigning planting date in the main plot (factor A), variety in the sub plot (factor B) and age of seedling in the sub-sub plot (factor C). Five planting dates (20 November, 30 November, 10 December, 20 December and 30 December), two maize varieties (BARI maize-6 and Pacific-11) and three ages of seedlings (Direct seeding, 14-day old and 21-day old seedlings) were included as treatments in the experiment. Seedlings were raised in the dry bed underneath polythene sheet nursery. The results revealed the variety Pacific-11 produced significantly higher grain yield in the earlier 20 and 30 November plantings irrespective of direct seeding and age of seedlings. There was no significant difference in respect of grain yield in the earlier 20 and 30 November plantings with all seedling ages but planting of 14-day old seedling the crop may be harvested about 7 days earlier, while planting of 21-day old seedling crop may be harvested about 12 days earlier than direct seeding. Transplanting of 14-day old seedling at 10, 20 and 30 December produced higher

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grain yield compared to both direct seeding and 21-day old seedling along with 5-6 days short field duration than direct seeding. This early harvest may save the crop from natural vulnerability of hailstorm and rains, and may help in early establishment of the next crop like sesame, aus rice, mungbean, blackgram, jute etc.

Keywords: Planting date; age of seedling; yield and yield attributes; maize.

1. INTRODUCTION

Maize (*Zea mays* L.) is the top most ranking cereal in terms of higher grain yield and holds third position in respect of total production following wheat and rice in the world. Maize is nutritionally superior to most other cereals as it contains 9.0% protein, 3.4% fat, 1.1% ash, 1.0% starch fibre, 0.30% thiamine, 0.08% riboflavin and 1.9% niacin [1]. In Bangladesh, maize is primarily used as feed for livestock and poultry, and a considerable proportion of grains and green cobs is used for human consumption. The demand of maize is thus rapidly increasing. It is expected to be increased further with the establishment of maize-based food industries, and poultry, dairy and fish farms. This may lead to an enormous increase in maize import, which might result in depleting the hard-earned foreign currency. Hence, special emphasis should be given for increasing the indigenous maize production in order to fulfill the present demand as well as of the future. The agro-climatic conditions of Bangladesh are favourable for maize cultivation round the year. However, *rabi* season is reported to be the best time for maize cultivation with the optimum time of planting ranging from mid November to end November [2]. Maize is generally grown after harvest of transplant aman rice and consequently, planting gets delayed. In the *char* lands, the potential maize growing areas of Bangladesh, the lands attain '*joe'* condition in late after recession of flood water and thus, maize planting goes beyond the optimum time. Mohamed and Shams (1991) reported that grain yield of hybrid maize was affected less by late sowing than the synthetic and open pollinated varieties [3]. Porwal and Jain [4] stated that grain yield of maize reduced due to early and delayed plantings to mid November by 3.9 to 66.4%. Hence, planting time and choice of variety should be important considerations for maize cultivation. However, in addition to reduced grain yield the late sown crops may experience natural hazards at the later stage of growth due to nor'wester. Again the sowing of following crops like jute, aus rice, mungbean, blackgram etc. may be affected by the late maize harvest. So, the development of an appropriate early plant establishment technique through agronomic management is essential for maize cultivation under these situations. Basu et al. [5] opined that transplanting of 21-day old seedlings gave identical grain yields with direct sown crop and matured 8-10 days earlier. Maize crop could also be established much earlier through transplanting technique which may produce higher yield [6]. Badran [7] stated that under late planting conditions, transplanting of maize may be a possible alternative to direct sowing. Therefore, transplanting of seedling may be an important area of study for maize cultivation considering the field duration and early plant establishment under Bangladesh conditions. On the basis of the discussion made above, the present research work was undertaken to evaluate the performance of transplanting techniques including varying seedling ages of maize against direct planting of seed under different dates.

2. MATERIALS AND METHODS

The experiment was carried out to find out suitable planting material either seed or seedling in different planting time for producing higher grain yield of maize at the research fields of the Bangladesh Agricultural Research Institute, Regional Station, Jamalpur, Bangladesh during rabi (winter) 2003-2004. The experiment site is medium high land belongs to the agro-ecological zone 'Old Brahmaputra Flood Plain' (AEZ-9) located at 24°56′11″ N latitude and 89°55′54″ E longitude and at an altitude of 16.46 m. The soil texture was silt loam and it was placed in the subgroup Aeric Haplaquept of the sub-order Aquept under the order Inceptisols according to USDA system [8]. The land remained fallow before initiation of the experiment. The initial soil sample was collected at a depth of 0-30 cm and analyzed at the central laboratory, Bangladesh Institute of Nuclear Agriculture, Mymensingh. The pH of the soil was 6.35 and the soil contents 0.98% organic matter, 0.118% total N, 10.58 µg/g of soil available P, 0.115 meq/100 g soil exchangeable K, 16.28 µg/g soil available S, 0.42 µg/g soil available Zn, 0.18 µg/g soil available B, 3.40 µg/g soil available Cu, 7.856 µg/100 g soil available Ca and 5.19 meq/100 g soil available Mg. The experiment site is located under the sub-tropical zones having the characteristics of heavy rainfall, high humidity, high temperature and relatively long days during the summer season (mid March to mid October). There prevails scanty rainfall, low humidity, low temperature and short days during the winter season (mid October to mid March). Winter season starts with low temperature and plenty of sunshine. The air temperature increases as the season advances towards summer season, whereby night temperature becomes much lower than that of the day. The total rainfall was found 313.00 mm during the crop growing period from November to April. There were no rains in the month of December and attained congenial temperature during crop growing period. The average minimum temperature of 15.01℃ was found in the month of January 2004 and the corresponding maximum temperatures 23.53℃ was marked in the month of April 2004. The treatments of the experiment were five planting dates (20 November, 30 November, 10 December, 20 December and 30 December), two varieties (BARI maize-6 and Pacific-11) and three ages of seedlings (Direct seeding, 14-day old and 21-day old seedlings). Seedlings were raised in the dry bed underneath polythene sheet nursery. Seeds were planted earlier at different dates in the bed to attain 14- and 21-day old seedlings. For example, to attain 14- and 21-day old seedlings seeds were planted in the nursery on 6 November and 31 October 2003, respectively for 20 November planting. A split-split plot design with 3 (three) replications arranging planting date (factor A) in the main plot, variety (factor B) in the sub plot and age of seedling (factor C) in the sub-sub plot was used to carry out the experiment. For direct seeding a seed rate of 20 kg ha^{-1} while for transplanting a seed rate of 17.00 kg ha^{-1} was used. Seedling raising method, fertilizer application rate and methods, and all intercultural operations were described by Biswas et al. [9]. Twenty plants were randomly selected to collect data on length of cob, cob diameter, number of grains cob^{-1}, 1000 grain weight, grain yield and harvest index. Harvest area of 10.5 m^2 was used for calculation of grain yield in t ha^{-1}. Collected data were analysed statistically following analysis of variance technique as per design of the experiment with the help of a computer package program MSTATC. Mean separation was done at 5% level of probability following Duncan's Multiple Range Test (DMRT) wherever F values were significant either at 1% or 5% level of probability.

3. RESULTS AND DISCUSSION

3.1 Effects of Planting Date

3.1.1 Yield and yield attributes

Planting date did not exhibit significant effect on number of grains cob^{-1} but on plant height at harvest, length of cob, cob diameter, number of cobs plant^{-1}, number of grain rows cob^{-1}, number of grains row^{-1} and 1000 grain weight (Table 1). The tallest plant was found in 10 December planting while the shortest plant was found in 20 November planting irrespective of variety and age of seedling. The results did not agree with Prodhan [10] who found the tallest plant in November than December sowing. This might be due to variation in the soil and climatic factors as the locations were different. The highest length of cobs was recorded for the 20 November planting. Planting dates of 30 November and 10 December also gave statistically similar length of cob to 20 November planting while the lowest length of cob was found in 30 December planting. There were no significant differences up to 20 December in terms of cob diameter being the highest in 20 November planting. December 30 planting had the lowest cob diameter. Number of cobs plant^{-1} and number of grain rows cob^{-1} were also significantly highest in 20 November planting. The crop planted at 10 December produced statistically similar number of grain rows cob^{-1} to the 20 November planting. Number of cobs plant^{-1} decreased progressively with delayed plantings while number of grains row^{-1} increased in the delayed plantings. But 1000-grain weight was found to reduce as the plantings were delayed. Grain yield was mainly ascribed to higher number of cobs plant^{-1}, number of grains cob^{-1} and 1000 grain weight. Hence, the earlier two plantings viz. 20 November produced the highest grain yield that was closely followed by 30 November planting. Grain yield reduced significantly beyond 30 November planting and the lowest was obtained from the last planting of 30 December due to its lowest number of cobs plant^{-1}, and 1000 grain weight mainly. Sandhu and Hundal [11] stated that grain yields decreased in later sowing were mainly associated with lower 100 grain weight. The highest stover yield was obtained in 30 November planting which was statistically similar to 20 November. Stover yield reduced significantly beyond 30 November planting and the lowest stover yield was obtained from 30 December planting. The early planting also gave the highest harvest index and beyond 10 December planting, harvest index reduced significantly compared to 20 November planting.

3.2 Effects of Variety

3.2.1 Yield and yield attributes

Yield and all the yield components except cob diameter and number of grains row^{-1} differed significantly between the varieties (Table 2). The results revealed that Pacific-11 had the higher values than BARI maize-6 in respect to all yield components which in turn produced the highest grain yield (Table 2). Grain yield of Pacific-11 was about 24.11% higher than BARI maize-6. Pacific-11 also produced the highest stover yield and harvest index. Anil and Sezer [12] observed that there were significant differences between the cultivars in terms of plant height, number of grains, ear weight etc. of sweet corn transplant.

3.3 Effects of Age of Seedling

3.3.1 Yield and yield attributes

All the characters except number of grains row^{-1} showed significant variations among the seedling ages (Table 3). Direct seeding had the highest values in respect of all yield contributing characters except 1000 grain weight. Direct seeding produced the tallest plant and it reduced gradually and the shortest plant was found in 21-day old seedling. Thousand grain weight increased significantly in the older age of seedling. The lowest 1000 grain weight was obtained from direct seeding while the highest was obtained from the older seedling (21-day old). The highest grain yield was found in 14-day old seedling while the lowest was found in 21-day old seedling. Grain yield in 14-day seedling was possibly compensated by the heavier grain size in spite of its lower number of cobs plant^{-1} and number of grains cob^{-1} than direct seeding. Direct seeding produced the second highest grain yield which was statistically similar to 14-day old seedling. Stover yield was decreased progressively with the increase of seedling age while HI increased with the increase of seedling age.

There were no significant differences for the interaction of variety and age of seedling, and interaction of planting date, variety and age of seedling in terms of yield and yield attributes. Hence, the results of these interactions were not presented here. Interaction of variety and planting date, and planting date and age of seedling were found significant and the results have been described as follows.

3.4 Interaction Effects of Variety and Planting Date

3.4.1 Yield and yield attributes

There were significant differences in respect of number of cobs plant^{-1}, grain yield, stover yield and harvest index but other parameters did not differ significantly due to interaction effect of planting date and variety (Table 4). The results exhibited that the highest number of cobs was produced by the combination of V_2 x D_1 and the lowest number was recorded from V_1 x D_5 combination. However, the highest grain yield was obtained from the combination of V_2 x D_1 which was closely followed by the combination of V_2 x D_2. The lowest grain yield was recorded from the combination of V_1 x D_5. Grain yield was decreased significantly in the later plantings beyond 30 November in both varieties. Hybrid maize was affected less and yielded higher than the synthetic and open pollinated varieties by late sowing [3]. The highest stover yield was obtained from the combination of V_2 x D_1 and it was significantly different from the others. The combination of V_2 x D_2 gave the highest harvest index which was statistically similar to the combinations of V_1 x D_1, V_2 x D_1, and V_2 x D_4 (Table 4). The results revealed that Pacific-11 yielded significantly higher than BARI maize-6.

As the interaction effect of variety and planting date was significant it was found that grain yield also reduced beyond 30 November planting and the lowest grain yield was obtained from 30 December in both varieties irrespective of age of seedling. The correlation studies presented in Table 5 indicated that number of cobs m^{-2} and 1000 grain weight were the main determinants for grain yield. Although no significant difference was observed for number of grains cob^{-1} but an increasing trend was observed with late planting while a reverse result was observed for 1000 grain weight in both varieties. Grain yield decreased with delayed plantings at or after 10 and 30 December produced the lowest grain yield for both varieties of Pacific-11 and BARI maize-6.

Table 1. Yield and yield attributes of maize as influenced by planting date during *rabi* 2003-2004

Planting date	Plant height at harvest (cm)	Length of cob (cm)	Cob diameter (cm)	Number of cobs m^{-2}	Number of grains cob^{-1}	1000-grain weight (g)	Grain yield (t ha^{-1})	Stover yield (t ha^{-1})	Harvest index (%)	Field duration (days)
20 November	191.1b	17.5a	5.2a	7.04a	407.2	370.2a	10.49a	8.88ab	54.26a	139
30 November	205.9ab	17.0a	5.0a	6.71b	412.9	373.68a	10.36a	9.06a	53.18ab	139
10 December	214.7a	16.7ab	5.0a	6.39c	426.2	352.5b	9.57b	8.62b	52.59bc	136
20 December	203.8ab	16.0bc	5.0a	6.06d	423.9	340.7c	8.76c	7.93c	52.33bc	132
30 December	194.3b	15.8c	4.9b	5.66e	418.7	339.4c	8.00d	7.42d	51.83c	129
Level of significance	*	**	*	**	NS	**	**	**	**	-
CV(%)	10.03	6.29	2.62	5.46	5.24	2.66	2.20	5.93	2.69	-

*Figures in a column having no or similar letter(s) do not differ significantly while those with different letter(s) differ significantly at 5% level of probability; * = Significant at p≤0.5; ** = Significant at p≤0.01; NS = Not significant at 5% level*

Table 2. Yield and yield attributes maize as influenced by the variety during *rabi* 2003-2004

Treatment	Plant height at harvest (cm)	Length of cob (cm)	Cob diameter (cm)	Number of cobs m^{-2}	Number of grains cob^{-1}	1000-grain weight (g)	Grain yield (t ha^{-1})	Stover yield (t ha^{-1})	Harvest index (%)	Field duration (days)
Variety										
BARI maize-6	193.2b	16.0b	5.0	5.92b	408.2b	341.1b	8.15b	7.49b	52.10b	134
Pacific-11	210.8a	17.3a	5.0	6.83a	427.4a	369.4a	10.72a	9.27a	53.57a	135
Level of significance	**	**	NS	**	**	**	**	**	**	-
CV(%)	7.06	4.50	2.37	5.41	6.62	2.82	2.44	3.85	2.20	-

Table 3. Yield and yield attributes of maize as influenced by age of seedling during *rabi* 2003-2004

Age of seedling (days)	Plant height at harvest (cm)	Length of cob (cm)	Cob diameter (cm)	Number of cobs m^{-2}	Number of grains cob^{-1}	1000-grain weight (g)	Grain yield (t ha^{-1})	Stover yield (t ha^{-1})	Harvest index (%)	Field duration (days)
0	224.1a	17.1a	5.0a	6.58a	430.4a	337.5c	9.47a	9.23a	50.43c	141
14	204.2b	16.7a	5.0a	6.42b	423.3a	355.1b	9.59a	8.35b	53.28b	135
21	177.6c	16.1b	4.9b	6.11c	399.8b	373.2a	9.25b	7.56c	54.79a	129
Level of significance	**	**	**	**	**	**	*	**	**	-
CV(%)	6.10	4.37	2.05	4.72	6.09	2.51	2.54	5.19	2.34	-

Note: '0' = Direct seeded

Table 4. Yield and yield attributes of maize as influenced by the effects of interaction of variety and planting date during *rabi* 2003-04

Interaction	Plant height at harvest (cm)	Length of cob (cm)	Cob diameter (cm)	Number of cobs m^{-2}	Number of grains cob^{-1}	1000-grain weight (g)	Grain yield (t ha^{-1})	Stover yield (t ha^{-1})	Harvest index (%)	Field duration (days)
$V_1 \times D_1$	181.1	17.1	5.1	6.40c	398.0	353.8	8.92d	7.48d	54.48a	139
$V_1 \times D_2$	196.3	16.2	5.1	6.33c	396.2	357.7	8.90d	8.48c	51.21cd	138
$V_1 \times D_3$	206.0	16.0	5.0	5.82d	426.6	335.4	8.22e	7.38d	52.59b	135
$V_1 \times D_4$	196.4	15.5	5.0	5.60de	419.9	329.3	7.69f	7.51d	50.65d	130
$V_1 \times D_5$	186.1	15.1	4.8	5.43e	400.5	329.3	7.01g	6.58e	51.56b-d	130
$V_2 \times D_1$	201.1	17.8	5.1	7.68a	416.4	386.5	12.06a	10.27a	54.03a	139
$V_2 \times D_2$	215.5	17.8	5.0	7.09b	429.7	389.5	11.83a	9.64b	55.14a	139
$V_2 \times D_3$	223.4	17.5	5.0	6.95b	425.9	369.6	10.92b	9.87b	52.58b	136
$V_2 \times D_4$	211.3	16.6	5.0	6.52c	427.9	352.0	9.83c	8.35c	54.00a	133
$V_2 \times D_5$	202.6	16.6	4.9	5.90d	437.0	349.5	8.99d	8.26c	52.11bc	129
Level of significance	NS	NS	NS	*	NS	NS	**	**	**	-
CV(%)	7.06	4.50	2.37	5.41	6.62	2.82	2.44	3.85	2.20	-

*Figures in a column having no or similar letter(s) do not differ significantly while those with different letter(s) differ significantly at 5% level of probability; * = Significant at $p \le 0.05$; ** = Significant at $p \le 0.01$; NS = Not significant at 5% level; V_1=BARI maize-6, V_2= Pacific-11, D_1=20 November, D_2= 30 November, D_3= 10 December, D_4= 20 December, D_5= 30 December*

Table 5. Interrelationship of grain yield and yield attributes of maize under different planting dates during rabi 2002-2003

Characters correlated	Values of 'r'	
	BARI maize-6	**Pacific-11**
Grain yield vs number cobs palnt^{-1}	0.971**	0.959**
Grain yield vs number of grains cob^{-1}	-0.267^{ns}	-0.760^{ns}
Grain yield vs 1000 grain weight (g)	0.911*	0.974**

3.5 Interaction Effects of Planting Date and Age of Seedling

3.5.1 Yield and yield attributes

None of the characters except 1000 grain weight, grain yield, stover yield and harvest index differed significantly due to interaction effects of planting date and age of seedling (Table 6). The results revealed that in the early plantings of 20 and 30 November, direct seeding (0 day-old) had the highest grain yield but thereafter planting of 14-day old seedling produced the highest. Twenty-one-day old seedling produced statistically similar grain yield to that of direct seeding at all planting dates. The results clearly indicated that under late planting conditions 14-day old seedling may be transplanted to obtain higher grain yield. The results also indicated that 21-day old seedling may be used at all planting dates sacrificing grain yield to some extent than direct planting with the advantage of about 2 week early harvest. This could save the crop from natural hazards and the grower could avail high market price of grain. The following crops like aus rice, jute, pulses etc. may also be grown in optimum time after harvest of maize. The combination of D_2 x direct seeding (0 day-old) gave the highest stover yield. Stover yield reduced significantly in the planting of 14- and 21-day old seedlings under any planting dates. The combination of D_1 x 21-day old seedlings had the highest harvest index. The combination of D_2 x 21-day old seedling produced statistically similar harvest index to the combination of D_1 x 21-day old seedling. However, in general, increased harvest indices were found in the planting of 21-day old seedling than planting of 14-day old seedling and direct seeding at all dates (Table 6).

The results revealed that grain yield differed significantly due to interaction effects of planting date and age of seedling. It was found that direct seeding produced higher grain yield but not significantly different from 14- and 21-day old seedlings in 20 and 30 November plantings. At 10 December, 14-day old seedling gave the highest grain yield statistically at par with direct seeding but significantly different from 21-day old seedling (Table 6). However, onward 10 December, planting of 14-day old seedling gave significantly higher grain yield than the others while direct seeding and planting of 21-day old seedling yielded statistically similar to each other. But field duration variation was much wider among the planting dates. Late planted crops matured very early and there was short period of grain filling (silking to maturity) compared to early planted crops. The crop planted at 10 December produced the tallest plant irrespective of variety and seedling age. Planting of 14-day old seedling was clearly different, producing higher grain yield than direct seeding in most cases and particularly at late condition. The crops planted at the optimum time silked by the end of February and matured by the mid of April. Apparently, this time might be suitable for flowering and grain filling. The photoperiod and temperature of this period are conducive to grain development. The major effect of cool temperature is the extending duration of grain filling period, increasing total light interception, and enhancing yield. Transplanted crops gave higher grain yields than direct seeded crops and might be a possible alternative to direct seeding specially under late planting condition [13,7]. Dale and Drennan [14] also found that planting date and seedling age interacted significantly. They reported that planting of 12-day old seedling performed best in early planting, whereas older seedling (42-day old) gave higher grain yield in later plantings. Khehra et al. [15] described that differences due to age of seedling, and date of planting and direct seeding were significant for plant height, days to silk and days to maturity. Increased seedling age or delayed transplanting decreased days to silk, days to maturity and plant height. They also recorded the taller plants in direct seeded crops.

Combined effect of variety and age of seedling, and planting date, variety and age of seedling were found non-significant for all the characters.

4. CONCLUSION

The results revealed that farmers could transplant maize seedling on the mud just after recession of flood water and thus the crop may be established earlier in the season. There were no significant differences in respect of grain yield in the earlier 20 and 30 November plantings but the crop may be harvested about 7 days earlier with 14-day old seedling while 12 days-earlier with 21-day old seedling. Under late planting condition beyond 30 November, transplanting of 14-day old seedling may produce higher grain yield compared to both direct seeding and 21-day old seedling along with 5-6 days reduced field duration than direct seeding. The early harvest may save the crop from natural vulnerability of hailstorm and rains, and may facilitate in early establishment of the subsequent crops like sesame, aus rice, mungbean, blackgram, jute etc.

Table 6. Yield and yield attributes of maize as influenced by the combined effect of planting date and age of seedling during *rabi* 2003-04

Interaction	Plant height at harvest (cm)	Length of cob (cm)	Cob diameter (cm)	Number of cobs m^{-2}	Number of grains cob^{-1}	TGW (g)	Grain yield (t ha^{-1})	Stover yield (t ha^{-1})	Harvest index (%)	Field duration (days)
Planting date (D) × Age of seedling (days)										
D_1 × 0	216.90	18.11	5.10	7.275	414.00	360.15de	10.61a	9.59b	52.37d	145.5
D_1 × 14	193.17	17.55	5.03	7.074	412.23	367.68cd	10.48ab	9.06b-d	53.71cd	138.7
D_1 × 21	163.30	16.80	5.02	6.763	395.38	382.72b	10.38ab	7.98e	56.69a	132.2
D_2 × 0	228.48	17.59	5.09	6.947	428.03	353.43e-g	10.50ab	10.48a	49.71e	144.7
D_2 × 14	204.82	17.05	5.04	6.805	414.55	369.10cd	10.33ab	8.69d	54.00cd	138.2
D_2 × 21	184.38	16.37	4.98	6.380	396.22	398.20a	10.26b	7.99e	55.81ab	132.7
D_3 × 0	231.93	17.28	5.06	6.654	439.57	332.60hi	9.61cd	9.26bc	50.70e	143.0
D_3 × 14	222.87	16.65	4.97	6.489	429.93	351.67e-g	9.77c	8.88cd	52.37d	136.5
D_3 × 21	189.33	16.30	4.92	6.016	409.13	373.23bc	9.33de	7.73ef	54.69bc	128.8
D_4 × 0	231.30	16.45	5.01	6.230	436.92	322.57ij	8.67f	8.66d	49.82e	137.3
D_4 × 14	202.57	15.98	4.98	6.108	427.60	345.08fg	9.14e	7.80ef	53.73cd	131.2
D_4 × 21	177.68	15.67	4.91	5.840	407.27	354.35ef	8.47fg	7.33f	53.43cd	126.3
D_5 × 0	211.87	15.90	4.91	5.807	433.33	318.62j	7.95h	8.13e	49.57e	134.3
D_5 × 14	197.80	16.38	4.92	5.615	432.03	342.10gh	8.24g	7.34f	52.61d	129.3
D_5 × 21	173.37	15.23	4.75	5.571	390.87	357.53de	7.82h	6.78g	53.32cd	124.2
Level of significance	NS	NS	NS	NS	NS	*	*	**	**	
CV %	6.10	4.37	2.05	4.72	6.14	2.51	2.54	5.19	2.34	

*Figures in a column having no or similar letter(s) do not differ significantly while those with different letter(s) differ significantly at 5% level of probability; * = Significant at p≤0.05; ** = Significant at p≤0.01; NS = Not significant at 5% level; D_1=November 20, D_2= November 30, D_3= December 10, D_4= December 20, D_5 =December 30, '0' = Direct seeding*

COMPETING INTERESTS

Author has declared that no competing interests exist.

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