Effect of different sowing dates and various varieties on seedling growth of late *kharif* onion (*Allium cepa* L.) in Assam

ABSTRACT

A field experiment was conducted on sandy loam soil of Horticulture Experimental Farm, Department of Horticulture, College of Agriculture, Assam Agricultural University, Jorhat, Assam during the year 2020-21 and 2021-22. The experiment was conducted on "the Eeffect of different sowing dates and various varieties on seedling growth of late *kharif* onion (*Allium cepa* L.) in Assam."Fifteen treatment combinations comprising of five onion varieties viz., Arka Kalyan, Bhima Dark Red, Agrifound Dark Red, Bhima Super and Bhima Red and three dates of sowing viz., 25th August, 5th September and 15th September were tested in Factorial Randomized Block Design (FRBD) with three replications. At the nursery stage, on the basis of pooled data, the relationship of different growth characters with various varieties and different dates of sowing revealed that variety Bhima Super sowing aton 25th August (D_1V_4) was the best in the number of leaves (3.77), Fresh weight of seedling (344.16 mg) and dry weight of seedlings (58.85 mg) at 40 days of sowing. Number of leaves per plant 25, 30, and 35 days after sowing were not affected by combination of various varieties and different dates of sowing.

KEYWORDS: Onion, Sowing dates, Seedling, Varieties, Late *kharif*

1. INTRODUCTION

Onion (*Allium cepa* L.) is an important bulb crop of India and the most widely cultivated species of the genus Allium with chromosome number: 2n=2x=16. It is a member of the monocotyledon family Alliaceae. It is considered to have originated in Central Asia. The eEdible portion of onion is modified stem and is known as bulb. Onion has been used as food since time immemorial. It is the most widely used vegetables due to its flavour. Onion is commonly used for salad and culinary purposes, also against sun stroke.

Comment [AO1]: Sugerencia: The edible portion of the onion is a modified stem and is known as a bulb. Onion has been used as food since time immemorial. It is the most widely used vegetable due to its flavor. Onion is commonly used for salad and culinary purposes, also against sunstroke.

In India, onion is mainly cultivated as in thewinter seasonabout 60%, followed by 20% each in *kharif* and late *kharif* seasons (Tripathy *et al*., 2013). Production of onion in *kharif* and late *kharif* season is more important to have continuous supply of onion around the year and to stabilize the market prices (DOGR, 2013). Onion cultivars reveal wide variation in their yielding ability and potential when grown under varied agro-climatic zones of the country (Suhas *et al.,* 2018). Successful onion production depends on the selection of suitable varieties that are adapted to different specific environmental conditions. Sowing time is one of the important factors that greatly influence the growth, yield, and quality of onions (Abdeiall *et al*., 2012 and Kandil *et al*., 2013). Various varieties with different times of sowing exert a distinct effect on the growth of onion. Since little information is available about late *kharif* onions, it was felt imperative to find out suitable varieties with the best sowing time for its successful cultivation under Jorhat conditions as a basic step towards its popularization. Hence, the present experiment was conducted to study the effect of different sowing dates and various varieties on the seedling growth of late *kharif* onion.

2. MATERIALS AND METHODS

The experiment was conducted on well-drained sandy loam soil of Horticulture Experimental Farm, Department of Horticulture, College of Agriculture, Assam Agricultural University, Jorhat, Assam during the year 2020-21 and 2021-22. The experiment was conducted on the "Effect of different sowing dates and various varieties on seedling growth of late *kharif* onion (*Allium cepa* L.) in Assam." Fifteen treatment combinations comprising of five onion varieties viz., Arka Kalyan, Bhima Dark Red, Agrifound Dark Red, Bhima Super and Bhima Red and three dates of sowing viz., 25th August, 5th September and 15th September were tested in Factorial Randomized Block Design (FRBD) with three replications. All the recommended cultural practices were adopted during the growing season. Six plants were selected at random in each plot to record the observations on a number of leaves and ten

plants were selected at random in each plot to record the observations on seedling fresh weight (mg) and seedling dry weight (mg). The experimental data recorded were subjected to statistical analysis using the analysis of variance technique suggested by Panse and Sukhatme (1978).

3. RESULTS AND DISCUSSION

3.1. Effects of different sowing dates, varieties and their interaction on number of leaves 25, 30, 35 and, 40 days after sowing

The number of leaves 25, 30, and 35 days after sowing was found to be statistically non-significant for sowing dates, varieties, and their interaction (Table 1 and 2) except their interaction on pooled analysis after 30 days of sowing. The number of leaves 40 days after sowing was influenced by sowing dates, varieties, and their interaction. A mMaximum (2.25) a number of leaves 30 DAS was recorded in D_1V_2 (Bhima Dark Red sowing on 25th Aug) which was statistically similar with D_1V_4 (Bhima Super sowing on 25th Aug) and D_2V_5 (Bhima Red sowing on 5th Sep) and minimum (2.11) number was recorded in D_1V_3 (Agrifound Dark Red sowing on 25th Aug) which was statistically similar with D_3V_1 (Arka Kalyan sowing on 15th Sep). A mMaximum (3.51) a number of leaves were found in D_1 (25th Aug)and minimum number (3.37) in D_3 (15th Sep). Variety Bhima Super (V_4) showed highest (3.62) number of leaves 40 DAS and minimum (3.23) showed by variety Arka Kalyan (V_1). In their interaction maximum (3.77) number of leaves were recorded in D_1V_4, was at par with D_1V_5 and D_2V_4 and minimum (3.19) number of leaves was recorded in D_3V_1.

The number of leaves per plant ~~was~~ progressively increased with the advancement of time. Above results clearly indicate that during early days of crop growth there was no significant effect of sowing dates, varieties and their interaction. In later days number of leaves per plant has shown a considerable variation under various dates of sowing and different varieties. D_1V_4 (Bhima Super sowing at 25th August) recorded maximum number of leaves at nursery stage than other treatments. This variation may be due to different varieties and their response to weather conditions which leads to increased metabolic activity contributing to the vegetative growth. These findings were in agreement with the findings ofCramer (2003) and Bosekengand Coetzer (2015).

Comment [AO2]: Sugerencia: The above results clearly indicate that during the early days of crop growth, there was no significant effect of sowing dates, varieties, and their interaction. In later days the number of leaves per plant has shown a considerable variation under various dates of sowing and different varieties. D1V4 (Bhima Super sowing on 25th August) recorded a maximum number of leaves at the nursery stage than other treatments. This variation may be due to different varieties and their response to weather conditions which leads to increased metabolic activity contributing to vegetative growth. These findings were in agreement with the findings of Cramer (2003) and Bosekeng and Coetzer (2015).

3.2. Effects of different sowing dates, varieties and their interaction on seedling fresh weight (mg) 25, 30, 35 and 40 days after sowing

Significant variation was observed among the sowing dates, varieties, and their interaction in respect of fresh weight of seedling 25, 30, 35, and 40 DAS (Table 1, 2, 3 and 4, Fig. 1). The fresh weight of seedling 25 DAS was highest for early sowing (88.23 mg) and variety Bhima Super (100.94 mg) whereas, lowest was found for late sowing (73.07 mg) and variety Arka Kalyan (50.83 mg). Significant interaction effect showed maximum (119.67 mg) seedling fresh weight at 25 DAS in D_1V_4, was at par with D_1V_2, D_1V_5, D_3V_2, D_3V_4 and D_3V_5 and minimum (36.33 mg) fresh weight was found in D_3V_1. Maximum fresh weight (162.83 mg and 245.87 mg) found in D_1 (25th Aug) and minimum (142.93 mg and 228.96 mg) in D_3 (15th Sep) 30 and 35 days after sowing. Variety Bhima Super (V_4) recorded maximum (192.33 mg and 274.50 mg) and variety Arka Kalyan (V_1) recorded minimum (112.33 mg and 195.27 mg) fresh weight 30, and 35 days after sowing. Treatment combination D_1V_4 recorded the highest (213.33 mg and 294.33 mg) fresh weight 30 and 35 DAS, was at par with D_3V_4 and minimum (95.50 mg and 185.16 mg) was found in D_3V_1. Dates of sowing showed non-significant effect on seedling fresh weight at 40 DAS but significant effect of varieties and their interaction was recorded. Maximum fresh weight 327.44 mg found in V_5 (Bhima Red) and minimum fresh weight (262.33 mg) 40 DAS was recorded in V_1 (Arka Kalyan).Maximum (345 mg) fresh weight 40 DAS was found in D_1V_5 (Bhima Red sowing on 25th Aug)was at par with D_1V_4, D_2V_4, D_2V_5, D_3V_4 and D_3V_5 and minimum (257 mg)fresh weight recorded in D_3V_1.

The above results clearly demonstrate that maximum seedling fresh weight exhibited by variety Bhima Super and Bhima Red with early sowing. More number of leaves per plant might have resulted in more photosynthesis and accumulation of food material, resulting in higher fresh weight of the plant. Findings are confirmatory with the results of Cramer (2003) and Zaghloul *et al.* (2013).

3.3. Effects of different sowing dates, varieties, and their interaction on seedling dry weight (mg) 25, 30, 35 and 40 days after sowing:

The data pertaining to the effect of sowing dates, varieties, and their interaction on seedling dry weight (mg) 25, 30, 35, and 40 days after sowing have been presented in Table 3 and 4 (Fig. 2). As Significant effect of date of sowing was noticed for seedling dry weight 25, 30, and 35 days after sowing but the effect was non-significant 40 DAS. Maximum plant dry weight 10.07 mg was recorded in D_1 (25th Aug) and lowest plant dry weight7.34 mg was recorded in D_3 (15th Sep) 25 DAS. Maximum seedling dry weight (11.56 mg) was recorded in variety V_4 (Bhima Super), followed by V_5 (Bhima Red) and V_2 (Bhima Dark Red) and minimum (5.23 mg) dry weight was observed in V_1 (Arka Kalyan). 25 DAS, the highest (14.46 mg) dry weight was recorded in D_1V_4 and minimum (3.9 mg) in D_3V_1. Maximum seedling dry weight (21.05 mg and 37.33 mg) was found in D_1 (25th Aug) and minimum (17.59 mg and 33.64 mg) in D_3 (15th Sep) 30 and 35 days after sowing. Variety Bhima Super (V_4) recorded the highest (26 mg and 42.83 mg) and variety Arka Kalyan (V_1) recorded the lowest (13.27 mg and 27.66 mg) dry weight 30 and 35 DAS. Treatment combination D_1V_4 recorded the highest (29.69 mg and 47.33 mg) seedling dry weight 30 and 35 DAS, and lowest (10.97 mg and 25.93 mg) was found in D_3V_1. Sowing dates have no significant effect on seedling dry weight 40 DAS. Maximum (52.70 mg) dry weight was recorded in V_4 (Bhima Super), which was at par with V_5 and minimum (37.12 mg) seedling dry weight was recorded in V_1 (Arka Kalyan). The dDry weight was maximum (58.85 mg) in D_1V_4 (35.98 mg) and minimum dry weight was obtained in D_3V_1.

Maximum plant dry weight was recorded for variety Bhima Super sowing at o25th August than other treatments. Early sowing dates accumulated grater dry matter in the plants. This might be attributed to environmental factors that might have influenced the growth characters to production of greater plant growth resulting in highest dry weight of seedling. This might be attributed to genetic makeup. The dry weight of plant depends upon the growth behavior of plant. More number of leaves might have enhanced the photosynthesis, accumulation of photosynthesis consequently in higher fresh weight and dry weight of plant. These results were confirmed with the reports of Zaghloul *et al.* (2013), and Bosekengand Coetzer (2015).

Table 1: Effect of sowing dates and varieties on number of leaves 25, 30, 35 and 40 DAS and seedling fresh weight (mg) 25 and 30 DAS (Pooled mean of two years 2020-21 and 2021-22)

Treatment	Number of leaves 25 DAS	Number of leaves 30 DAS	Number of leaves 35 DAS	Number of leaves 40 DAS	Seedling FW 25 DAS	Seedling FW 30 DAS
Sowing date	**Pooled**	**Pooled**	**Pooled**	**Pooled**	**Pooled**	**Pooled**
D_1 (25th Aug)	2.15	2.20	2.86	3.51	88.23	162.83
D_2 (5th Sep)	2.14	2.18	2.87	3.48	78.73	154.60
D_3 (15th Sep)	2.10	2.16	2.85	3.37	73.07	142.93
SEd (±)	0.04	0.03	0.05	0.03	2.90	4.93
CD (0.05)	NS	NS	NS	0.06	5.79	9.85
Variety	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled
V_1 (Arka Kalyan)	2.09	2.14	2.81	3.23	50.83	112.33
V_2 (Bhima Dark Red)	2.16	2.22	2.84	3.44	89.61	160.61
V_3 (AFDR)	2.10	2.13	2.79	3.39	67.33	128.61
V_4 (Bhima Super)	2.15	2.21	2.96	3.62	100.94	192.33
V_5 (Bhima Red)	2.14	2.21	2.90	3.58	91.33	173.39
SEd (±)	0.04	0.04	0.06	0.04	3.75	6.37
CD (0.05)	NS	NS	NS	0.08	7.48	12.72

Table 2: Interaction effect of sowing dates and varieties on number of leaves 25, 30, 35 and 40 DAS and seedling fresh weight (mg) 25 and 30 DAS (Pooled mean of two years 2020-21 and 2021-22)

Treatment	Number of leaves 25 DAS	Number of leaves 30 DAS	Number of leaves 35 DAS	Number of leaves 40 DAS	Seedling FW 25 DAS	Seedling FW 30 DAS

D_1V_1	2.14	2.17	2.89	3.25	62.33	126.83
D_1V_2	2.19	2.25	2.80	3.52	94.33	165.67
D_1V_3	2.08	2.11	2.74	3.41	66.83	128.33
D_1V_4	2.22	2.25	2.99	3.77	119.67	213.33
D_1V_5	2.14	2.22	2.86	3.63	98.00	180.00
D_2V_1	2.11	2.14	2.74	3.25	53.83	114.67
D_2V_2	2.17	2.22	2.86	3.47	82.83	151.16
D_2V_3	2.11	2.14	2.83	3.41	59.83	117.50
D_2V_4	2.11	2.19	2.88	3.63	86.00	171.17
D_2V_5	2.19	2.25	3.05	3.60	82.83	160.16
D_3V_1	2.02	2.11	2.80	3.19	36.33	95.50
D_3V_2	2.13	2.19	2.85	3.33	91.67	165.00
D_3V_3	2.11	2.14	2.80	3.33	75.33	140.00
D_3V_4	2.14	2.19	2.99	3.47	97.17	192.50
D_3V_5	2.11	2.17	2.80	3.49	93.17	180.00
SEd (±)	0.80	0.08	0.11	0.07	6.49	11.03
CD (0.05)	NS	0.15	NS	0.15	12.96	22.04

Table 3: Effect of sowing dates and varieties on seedling fresh weight (mg) 35 and 40 DAS and seedling dry weight (mg) 25, 30, 35 and 40 DAS (Pooled mean of two years 2020-21 and 2021-22)

Treatment	Seedling FW 35 DAS	Seedling FW 40 DAS	Seedling DW 25 DAS	Seedling DW 30 DAS	Seedling DW 35 DAS	Seedling DW 40 DAS
Sowing date	**Pooled**	**Pooled**	**Pooled**	**Pooled**	**Pooled**	**Pooled**
D_1 (25th Aug)	245.87	306.80	10.07	21.05	37.33	46.52
D_2 (5th Sep)	234.70	302.16	8.70	19.59	34.89	44.86
D_3 (15th Sep)	228.96	290.76	7.34	17.59	33.64	42.70
SEd (±)	6.55	8.52	0.31	0.74	1.31	1.58
CD (0.05)	13.07	NS	0.62	1.48	2.62	NS
Variety	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled
V_1 (Arka Kalyan)	195.27	262.33	5.23	13.27	27.66	37.12
V_2 (Bhima Dark Red)	243.89	293.11	9.41	20.15	36.45	44.68
V_3 (AFDR)	215.33	290.16	7.01	15.37	31.06	40.48
V_4 (Bhima Super)	274.50	326.50	11.56	26.00	42.83	52.70
V_5 (Bhima Red)	253.56	327.44	10.30	22.25	38.46	48.50
SEd (±)	8.45	11.00	0.40	0.95	1.69	2.05
CD (0.05)	16.88	21.97	0.80	1.91	3.39	4.09

Table 4: Interaction effect of sowing dates and varieties on seedling fresh weight (mg) 35 and 40 DAS and seedling dry weight (mg) 25, 30, 35 and 40 DAS (Pooled mean of two years 2020-21 and 2021-22)

Treatment combination	Seedling FW 35 DAS	Seedling FW 40 DAS	Seedling DW 25 DAS	Seedling DW 30 DAS	Seedling DW 35 DAS	Seedling DW 40 DAS
D_1V_1	208.17	271.00	6.49	15.47	29.72	38.65
D_1V_2	249.00	293.00	10.92	20.89	38.30	44.37
D_1V_3	214.50	280.83	7.19	15.46	30.82	40.63
D_1V_4	294.33	344.16	14.46	29.69	47.33	58.85
D_1V_5	263.33	345.00	11.27	23.74	40.49	50.11
D_2V_1	192.50	259.00	5.30	13.38	27.32	36.72
D_2V_2	240.17	281.83	7.23	18.61	35.30	44.05
D_2V_3	204.33	290.33	5.87	13.72	28.98	36.48
D_2V_4	263.00	311.50	9.33	22.49	40.26	49.67
D_2V_5	244.83	311.17	8.97	19.75	36.36	46.59
D_3V_1	185.16	257.00	3.90	10.97	25.93	35.98

D_3V_2	242.50	304.50	10.08	20.95	35.75	45.62
D_3V_3	227.16	299.33	7.98	16.92	33.38	44.33
D_3V_4	266.17	323.83	10.88	25.83	40.89	49.57
D_3V_5	252.50	326.16	10.67	23.28	38.52	48.79
SEd (±)	14.64	19.06	0.70	1.66	2.93	3.55
CD (0.05)	29.23	38.06	1.40	3.31	5.87	7.09

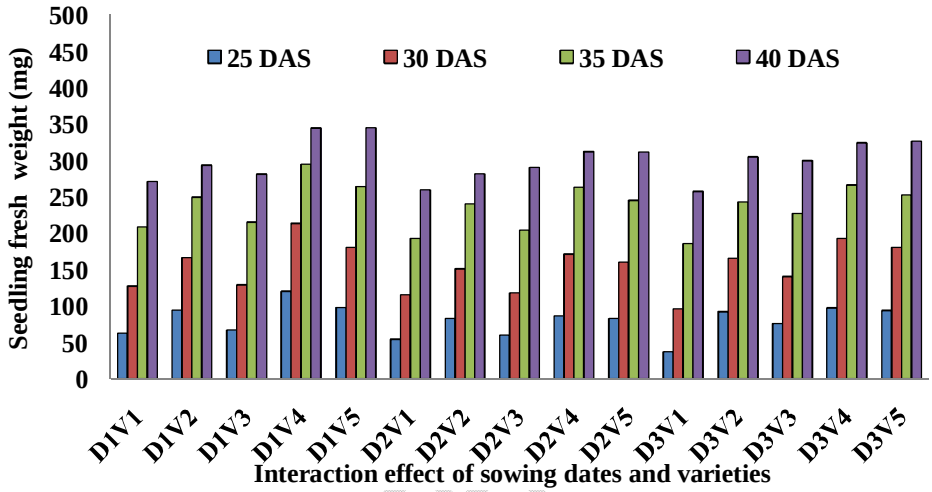

Fig.1:Seedling fresh weight (mg) 30, 35, 40 and 45 DAS on pooled analysis

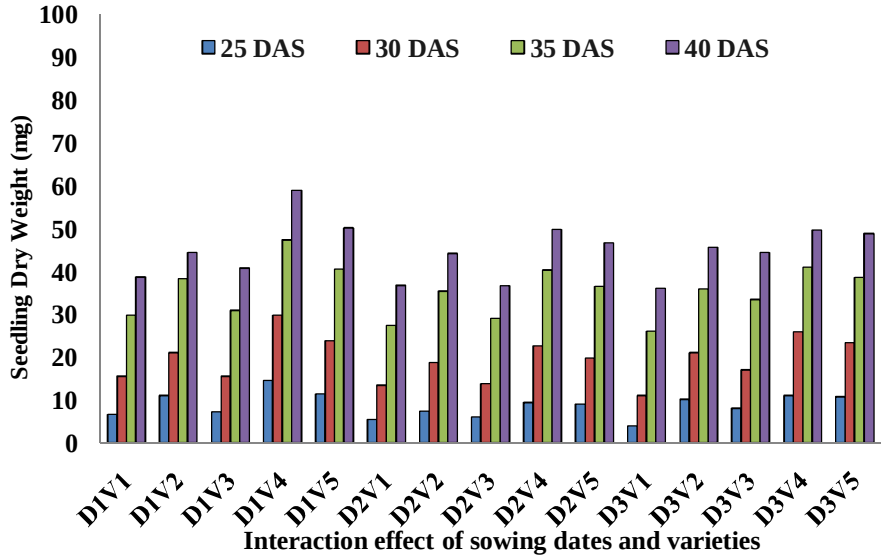

Fig.2: Seedling dry weight (mg) 25, 30, 35 and 40 DAS on pooled analysis

4. CONCLUSION

From the above discussion, it was evident that D_1V_4 (Bhima Super on 25th August sowing)is more suitable for vigorous and superior quality seedlings production in onion which finally shows better performance in the main field in terms of yield and yield attributing characters. The l~~L~~ast week of August was found ideal for sowing ~~of~~ crops to get healthy and superior quality seedlings over the crops sown in early or mid-September. Bhima Super and Bhima Red were found the best over other cultivars in studied parameters. Among the treatment combinations, D_1V_4 (Bhima Super on 25th August sowing) was the best in seedling growth parameters *viz*., seedling height (19.25 cm) and dry weight of seedlings (58.85 mg) 40 days after sowing. Treatment combination D_1V_5 (Bhima Red on 25th August Sowing)produced the highest fresh weight (345.00 mg) of seedling 40 days after sowing. Therefore, the variety of Bhima super and Bhima Red can be recommended for *kharif* season production in Assam. The n~~N~~umber of cultivars was only five for this study so more new varieties may be evaluated across the season in the future.

REFERENCES

Abdeiall, H. M.; Seham, M. A. and Sahim, S. M. (2012). Effect of planting dates on growth, yield, and quality of some green onion (*Allium cepa* L.) cultivars for local marketing and exportation. *J. Biol. Chem. Envron. Sci.* 7 (1): 33-47. Bosekeng, G.and Coetzer. G. M. (2015). Response of onion (*Allium cepa* L.) to sowing date and plant population in the Central Free State, South Africa. Afr. J. Agric. Res. 10 (4): 179-187.

Anonymous (2013). Vision 2050, Directorate of Onion and Garlic Research, Rajgurunagar, Pune, Maharashtra, India.

Cramer, C. S. (2003). Performance of fall-sown onion cultivars using four seeding dates. *J.Amer.Soc.Hort.Sci.*128 (4): 472–478.

Kandil, A. A.; Sharief, A. E. and Fathalla, H. (2013). Effect of transplanting dates of some onion cultivars on vegetative growth, bulb yield and its quality. *ESci J. Crop Prod.* 2 (3): 72-82.

Panse, V. G. and Sukhatme, P. V. (1978). *Statistical Methods for Agricultural Workers*. 3rd Ed., ICAR, New Delhi, pp. 347.

Suhas, Y. H., Amarananjundeswara, H., Tejaswini, H. R., Jagannath, H. R., Lakshmipathi, N. (2018). Evaluation of Onion Genotypes (Allium cepa L.) for Yield and Quality Parameters during Kharif Season in Eastern Dry Zone of Karnataka. *Int. J. Pure App. Biosci.* 6(6):552-557.

Tripathy, P.; Priyadarshini, A.; Das, S. K.; Sahoo, B. B. and Dash, D. K. (2013). Evaluation of Onion (*Allium Cepa* L.) Genotypes for Tolerance to Thrips (*Thrips Tabaci* L.) and Purple Blotch [*Alternaria Porri* (Ellis) Ciferri]. *Int. J. Bio-resour. Stress Manag.* 4 (4): 561-564.

Zaghloul, M. M.; El-Saady, W. A. and Hamad, K. M. (2013). Studies on onion seeds germination effect of moist-chilling on germination of onion seeds stored for two different periods and subsequent seedling growth. *J. Plant Prod.* 4 (3): 363-373.