Plant Archives Vol. 25, No. 1, 2025 pp. 1853-1859 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org

DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.no.1.269

SELECTION OF SUITABLE VARIETY AND TRANSPLANTING DATE FOR *KHARIF* ONION PRODUCTION

Ramesh Chand Meena, Sutanu Maji*, M.L. Meena, Razauddin, Rajesh Kumar Meena, Maya Ram and Dharmraj Meena

Department of Horticulture, School of Agricultural Sciences and Technology, Babasaheb Bhimrao Ambedkar University, Lucknow - 226 025 (U.P.), India.

*Corresponding author E-mail : majisutanu@gmail.com

(Date of Receiving-11-01-2025; Date of Acceptance-27-03-2025)

ABSTRACT

Selection of suitable variety and transplanting date is very important for successful onion cultivation specially when grown during *kharif* season. This study aims to evaluate the effects of different transplanting dates and varieties on yieldand bulb quality of *kharif* onion grown at subtropical climate of Lucknow, Uttar Pradesh, India. Ten varieties *viz.*, Bhima Red (V_1), Bhima Safed (V_2), Bhima Super (V_3), Bhima Raj (V_4), Bhima Kiran(V_5), Bhima Shweta (V_6), Bhima Shakti (V_7), Bhima Light Red (V_8), Bhima Dark Red (V_9), Bhima Shubhra (V_{10}) were transplanted on four datesi.e. 30th August(D_1),15th September (D_2),30th September (D_3),15th October (D_4) following two factor randomized block design with three replications. Data collected over two years revealed significant differences in bulb yield and quality of *kharif* onions depending on transplanting dates and varieties. Among the four transplanting dates and ten varieties tested, onion transplanted on August 30thexhibited the highest bulb yield and superior morphological bulb characteristics, including bulb yield per hectare, average bulb weight, number of scales, polar and equatorial bulb diameter, total soluble solids and total sugar content. Regarding varietal performance, Bhima Raj variety transplanted on August 30th(D_1) showed the highest bulb yield, while Bhima Shakti excelled in terms of bulb quality. Based on findingsof the experiment, it can be concluded that onion varietyBhima Raj transplanted on August 30th can be suggested for higher yield and selection of Bhima Shakti for bulb quality for profitable *kharif* onion production in Lucknow region. This approach definitely will make a bridge between market demand and production, reduce seasonal gap as well as ensure better economic returns for the farmers.

Key words : *Kharif* onion, Variety, Transplanting dates, Yield, Quality.

Introduction

Vegetables are an important and necessary part of the human diet. Known as the “queen of the kitchen,” onions (*Allium cepa* L.) are among the oldest and most significant vegetable crops cultivated in India. On the list of vegetable crops grown worldwide, onions, are valued second only after tomatoes. (Ratan *et al.*, 2017). The onion is a monocot and a member of the class Liliopsida and family Alliaceae. Geographic location and the associated biological parameters (day length, temperature, and moisture) classifies onion in many group. In addition to fungicidal, bacterial, anticholestrol, anti-cancer, and antioxidant properties like quercetin, onions also contain a lachrymatic agent and a potent antibiotic (Baghizadeh *et al.*, 2009).Furthermore, it has been noted to be abundant in phytochemicals, particularly the therapeutic flavonols (Javadzadeh *et al.*, 2009). Onions contain a phytochemical called allium and allyl disulphide, which, when crushed, transform into allicin which lower down the cholesterol by blocking the liver cells’ HMG-CoA reductase enzyme. In terms of area, output, and exports, India leads the globe. In India, onions are grown 60% of the time during the Rabi season and 20% during the *Kharif* and late *Kharif* seasons. However, the yield is quite low in India (16.1 tonnes per hectare), compared to 22 tonnes per hectare in China, 28.9 tonnes per hectare in Turkey and 33.7 tonnes per hectare in Egypt.In addition to the conventional *Rabi* crop, which is cultivated during the

winter, the *Kharif* crop, which is grown during the rainy season, is currently being grown successfully in the country's north and east, harvested in April or May, the *Rabi* crop is kept in storage across the nation and gradually made accessible for both internal and export markets until September or October.

From October to March, there is a severe shortage of onions throughout the country, which drives up costs. During this time of scarcity, a successful harvest during the *Kharif* season may reduce the gap between supply and demand for onions. Additionally, growing onions during the *Kharif* season gives farmers a wonderful way to increase their profits (Pandita, 1994).

Compared to the main rabi season onion, the off-season onion is more expensive. Choosing the right transplant date and varieties is crucial because it has an enormous effect (Prasad *et al*., 2017). The impact of environmental elements and edaphic factors on growth, yield and bulb quality is also determined by the transplanting date. It may differ depending on the area. Therefore, standardization of suitable date of transplanting and varieties is very important to maximise bulb yield andquality of onion (Sharief *et al*., 2013). Since onions are a photo-thermosensitive crop, planting times differ by location. The optimum months to plant *kharif* onions are July through August in Maharashtra and mid- to late August in the northern plains; in West Bengal and Orissa, transplanting is carried out as late as August or September (Pandey, 1993). However, there is negligible information about *kharif* onion production in subtropical area of Lucknow, Utter Pradesh. This paper will address the production strategy of *kharif* onion particularly selection of best performing variety and suitable date of transplanting in Lucknow subtropical climatic condition.

Materials and Methods

The experiment was conducted at Horticulture Research Farm in the Department of Horticulture, School of Agricultural Sciences and Technology, Babasaheb Bhimrao Ambedkar University, Lucknow, Utter Pradesh, India during 2022-23 and 2023-24 ($26^0$50' N, $80^0$52'E, 123 m MSL). The experimental site comes under sub-tropical climate having moderate dry summer andmedium annual rainfall. The experiment consisted of four different transplanting dates (D_1- 30 August, D_2-15 September, D_3-30 September, D_4-15 October) and ten Varieties-Bhima Red (V_1), Bhima Safed (V_2), Bhima Super (V_3), Bhima Raj (V_4), Bhima Kiran (V_5), Bhima Shweta(V_6), Bhima Shakti (V_7), Bhima Light Red (V_8), Bhima Dark Red (V_9), Bhima Shubhra (V_{10}). The experiment was laid out in two factor randomized block design with three replications having factor 1 – date of transplanting (level 4) and factor 2 – varieties (level 10). Truthfully labelled seeds of the selected onion cultivar were collected from Directorate of Onion and Garlic Research, Pune, India. Seeds were sown on raised beds (10-15 cm high, 1-1.2 m wide, and 3-4 m long) prepared for proper drainage and with addition of well-decomposed FYM (Farm Yard Manure). Soil drenching was done with copper oxychloride (3g/l) on the beds to prevent against attack of damping-off disease on seedlings. The seeds were sown (0.5 -1.0 cm deep in soil and 10 cm from row to row spacing) in the nursery on 15th July for transplanting on 30th August and on subsequent dates as per the date of transplanting in the experimental design to get seedlings of uniform age of about 45 days old for transplanting. Transplanting was done on 1m x 0.6m plots at 15 cm (R-R) × 10 cm (P-P) spacing when the seedlings were 15-20 cm tall and have 2-3 leaves on flat bed system having proper drainage facility. The entirerecommendedpackage of practices was adapted to all treatments uniformly to raise a good crop. Plots were irrigatedat intervals of 7-10 days until maturity depending on weather condition. During maturity, when 2/3rdof the leaves become yellow in colour, the bulbs were harvested and cured for short period for 5 days. Sample bulbs were taken from each plot for data collection. Observations were recorded for bulb yield, average weight of bulb, number of scales, polar diameter, equatorial diameter and TSS. Two years observed data was analysed as per standard methods (Sahu and Das, 2014) for 2 factors RBD and treatment means were compared at 5% level of significance.

Results

In the present investigation the effect of four transplanting dates 30th August (D^1), 15th September (2nd), 30th September (3rd), 15th October (4th) with ten varieties-Bhima Red (V_1), Bhima Safed (V_2), Bhima Super (V_3), Bhima Raj (V_4), Bhima Kiran (V_5), Bhima Shweta (V_6), Bhima Shakti (V_7), Bhima Light Red (V_8), Bhima Dark Red (V_9), Bhima Shubhra (V_{10}).

According to pooled value the maximum yield producing variety was Bhima Raj 356.26 q/ha and transplanting date (D_1) 30th August. In the 1st year, variety (V_4) Bhima Raj produced maximum yield (355.03q/ha) on (1st) date of transplanting (386.16q/ha). In the 2nd year, Bhima Raj (V_4) estimated maximum yield 357.48q/ha on 30th August (D_1) date of transplanting (388.11q/ha). In case of interaction effect, it was seen that 1st date of transplanting (D_1), Bhima Super (V_3) showed maximum yield 401.75 q/ha. Whereas, 2nd date of transplanting(D_2) Bhima Raj producing maximum yield 397.01 q/ha. While,

Table 1 : Effect of varieties and transplanting date on yield, average weight of bulb and number of scales of bulb.

	Yield					Average weight of bulb					Number of scales				
	D_1	D_2	D_3	D_4	Mean	D_1	D_2	D_3	D_4	Mean	D_1	D_2	D_3	D_4	Mean
V1	395.40	380.85	337.78	281.10	348.78	59.31	57.13	50.67	42.17	52.32	11.88	11.62	9.91	10.17	10.89
V2	360.57	338.99	311.21	255.28	316.51	54.09	50.85	46.68	38.29	47.48	10.28	9.98	9.70	9.18	9.78
V3	401.75	387.83	343.16	279.16	352.98	60.26	58.18	51.47	41.87	52.95	15.66	13.76	11.93	10.25	12.90
V4	398.58	397.01	346.02	283.41	356.26	59.79	59.55	51.90	42.51	53.44	15.10	15.35	12.16	10.97	13.39
V5	391.47	365.76	337.83	292.70	346.94	58.72	54.86	50.67	43.91	52.04	14.08	11.94	11.73	11.90	12.41
V6	393.75	369.79	336.68	277.15	344.34	59.06	55.47	50.50	41.57	51.65	10.58	10.56	9.87	9.78	10.20
V7	383.23	386.25	351.29	276.75	349.38	57.49	57.94	52.69	41.51	52.41	13.92	13.05	12.48	9.43	12.22
V8	386.57	371.24	343.35	280.60	345.44	57.99	55.69	51.50	42.09	51.82	12.59	12.88	11.89	10.68	12.01
V9	386.51	357.16	333.05	271.66	337.10	57.98	53.57	49.96	40.75	50.56	12.03	12.60	11.09	9.40	11.28
V10	373.37	357.15	342.32	259.33	333.04	56.01	53.57	51.35	38.90	49.96	10.91	11.20	10.08	9.89	10.52
Mean	387.12	371.20	338.27	275.71		58.07	55.68	50.74	41.36		12.70	12.29	11.08	10.16	
	SEm±	CD (p=0.05)				SEm±	CD (p=0.05)				SEm±	CD (p=0.05)			
Date (D)	2.641	7.451				0.506	1.427				0.098	0.276			
Varieties (V)	4.176	11.782				0.800	2.256				0.155	0.436			
Interaction (D*V)	8.353	NS				1.599	NS				0.309	0.873			

variety Bhima Shakti(V_7) transplanted on 3rd date of transplanting on 30th Sept. showed maximum yield 351.29 q/ha. On 4th date of transplanting variety Bhima Kiran (V_5) produced maximum yield 292.70 q/ha.

On the basis of two year experimental finding the average weight of bulb wasrecorded maximum at the 30th August (D_1) transplanting (58.07g) and in the variety Bhima Raj (53.44g) (pooled value). According to 1st year experiment, maximum average weight of bulb was found in the variety Bhima Raj (53.25g) and 1st date of transplanting (57.92g). Similarly, in 2nd year, variety Bhima Raj produced maximum average weight of bulb (58.62g) and 30th august (D_1) date of transplanting (58.22g). Interaction effect was seen statically nonsignificant, in the 1st date of transplanting variety Bhima Super (V_3) produced maximum average weight of bulb (60.26g) and in the 2nd date of transplanting variety Bhima Raj (V4) showing maximum average weight of bulb (59.55g). Variety Bhima Shakti (V_7) produced maximum average weight of bulb (52.69g) when transplanted on 30thSeptember (D_3). In the 4th date of transplanting, variety Bhima Kiran (V_5) obtained maximum average weight of bulb (43.91g).

Two year experimental result revealed that the effect of transplanting date and varieties on the number of scales of bulb was statically significant. The maximum number of scales producing variety (V_4) Bhima Raj (13.39) and 1st date of transplanting (12.70) based on the two year pooled data. In the 1st year of experiment variety (V_4) Bhima Raj showed maximum number of scales of bulb (13.25) and 30th August (D_1) recorded highest scales of bulb (12.49). Similarly, trend was noted for 2nd year showing maximum scales by Bhima Raj (13.54) and 1st (D_1) date of transplanting (12.91). Interaction effect recorded the maximum number of scales of bulb (15.66) (V_3) Bhima Super on D_1. Bhima Raj are transplanted at 15th September (D_2) are produce highest

Table 2 : Effect of varieties and transplanting date on diameter of bulb and TSS content.

	Polar diameter					Equatorial diameter					TSS				
	D_1	D_2	D_3	D_4	Mean	D_1	D_2	D_3	D_4	Mean	D_1	D_2	D_3	D_4	Mean
V1	64.22	63.99	60.70	50.37	59.82	61.70	61.08	58.72	48.50	57.50	12.58	12.65	11.72	11.35	12.07
V2	62.13	60.98	59.11	45.20	56.86	58.97	57.97	57.68	43.42	54.51	10.00	9.85	9.40	8.33	9.39
V3	65.76	64.84	63.33	52.49	61.61	63.45	62.74	60.83	50.20	59.30	14.65	12.55	12.47	11.20	12.72
V4	65.47	65.14	64.65	53.66	62.23	63.34	63.51	62.64	51.92	60.35	12.45	13.75	12.90	11.65	12.69
V5	64.25	63.03	63.72	54.15	61.29	62.52	60.47	60.43	52.44	58.96	13.95	13.46	12.15	11.95	12.88
V6	64.16	63.97	62.80	50.90	60.46	62.54	61.89	60.00	48.46	58.22	11.75	10.65	10.05	9.37	10.45
V7	63.96	64.56	64.82	49.02	60.59	61.40	62.50	62.86	46.73	58.37	15.05	13.15	13.13	11.15	13.12
V8	63.74	63.99	62.68	46.80	59.30	61.22	61.69	60.16	45.49	57.14	13.15	11.10	10.57	11.35	11.54
V9	62.97	62.63	60.89	47.60	58.52	60.71	60.50	58.40	45.73	56.33	10.85	11.05	9.97	9.03	10.22
V10	64.00	64.34	62.16	45.76	59.06	61.90	62.45	59.94	43.51	56.95	11.60	10.65	9.75	9.18	10.30
Mean	64.07	63.75	62.48	49.59		61.77	61.48	60.17	47.64		12.60	11.89	11.21	10.46	
	SEm ±	CD (p=0.05)				SEm ±	CD (p=0.05)				SEm ±	CD (p=0.05)			
Date (D)	0.443	1.250				0.54	1.53				0.119	0.335			
Varieties (V)	0.701	1.977				0.86	2.41				0.188	0.530			
Interaction (D*V)	1.401	NS				1.71	N/A				0.375	1.059			

number of scales of bulb (15.35). In the 3rd date of transplanting (D_3) variety (V_7) Bhima Shakti are best performing in the case of maximum number of scales of bulb (12.48) and variety (V_5) Bhima Kiran was produce maximum number of scales of bulb (11.90) transplanted at 15th Oct. (D_4).

The study revealed a significant effect of transplanting dates and varieties on the polar diameter of bulbs. Among the various transplanting dates, the 30th August transplanting date (D_1) had the most favourable effect, resulting in a polar diameter of 64.07 mm. Overall, the variety *Bhima Raj* (V4) demonstrated the best performance, in term of maximum polar diameter of 62.23 mm based on twoyearpooled value. In the first year, the highest polar diameter was observed in the variety *Bhima Raj* (62.14 mm) and the 30th August transplanting date (64.02mm). In the second year, the variety *Bhima Raj* (V_4) again showed the largest polar diameter (62.32 mm) with the same transplanting date (64.11mm). Statistical analysis confirmed that the interaction effect between transplanting dates and varieties was not significant. For the 30th August transplanting date (D_1), the variety *Bhima Super* (V_3) produced the highest polar diameter (65.76 mm). On 2nd date of transplanting (15thSeptember), *Bhima Raj* (V_4) recorded the maximum polar diameter (65.14mm). Whereas, the variety *Bhima Shakti* (V_7) attained the greatest polar diameter (62.80mm) with the 30th September transplanting date (D_3). Lastly, the variety *Bhima Kiran* (V_5) achieved the highest polar diameter (54.5 mm) with the 15th October transplanting date (D_4).

Among the four dateof transplanting, (D_1) 30th August (D_1) showed the highest equatorial diameter of bulbs (61.77mm), with the variety *Bhima Raj* (V_4) 60.35 mm. In the first year, the maximum equatorial diameter of bulbs was recorded in the 30th August transplanting date (61.65mm) and the variety *Bhima Raj* (V_4) 60.19mm. Similarly, in the second year, the results were consistent, with the 30th August transplanting date (60.90mm) and the

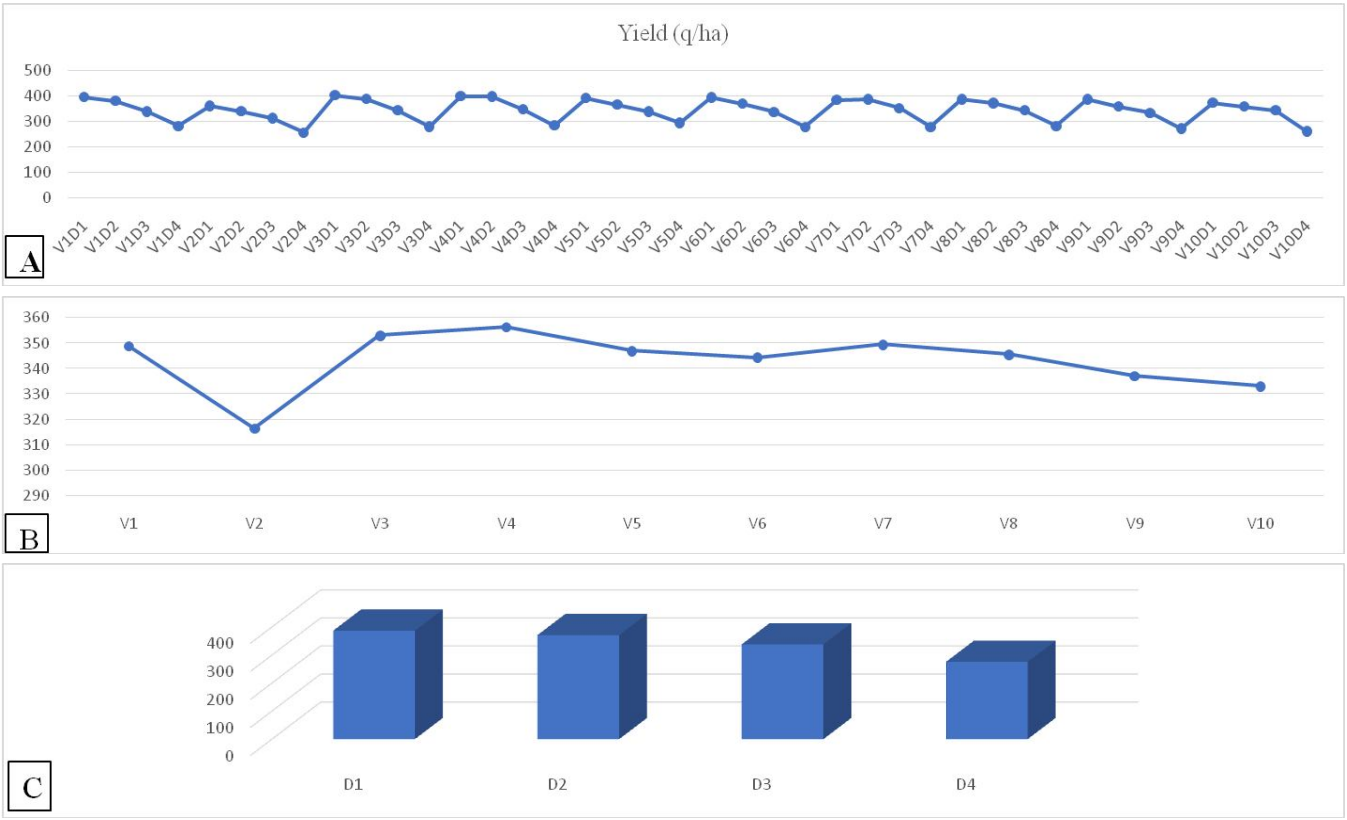

Fig. 1 (A, B, C) : A- Interaction effect of varieties and transplanting date on bulb yield; Effect of varieties (B) and date of transplanting (C) on bulb yield of *kharif* onion production.

variety *Bhima Raj* (V_4) 60.51mm showed the highest equatorial diameters. The interaction effect between transplanting dates and varieties was statistically non-significant. However, specific combinations showed notable results. For the first transplanting date (D_1), variety *Bhima Super* (V_3) produced the highest equatorial diameter (63.45 mm). On 15th Sept. transplanting date (D_2), *Bhima Raj* (V_4) achieved the maximum equatorial diameter (63.51mm). For the third transplanting date (D_3), variety *Bhima Shakti* (V_7) exhibited the highest equatorial diameter (62.86mm). while, the variety *Bhima Kiran* (V_5) showed the maximum equatorial diameter (52.44mm) when transplanted on the 15th October (D_4). Overall, the best performance in terms of equatorial diameter of bulbs was observed with the variety *Bhima Raj* (V_4) and the 30th August (D_1) transplanting date, according to the experimental findings.

The data pertaining to Twoyear pooled data, the exhibited highest TSS in the variety Bhima Shakti (13.12 with the transplanting date30th August(D_1). In the 1st year, the highest TSS was recorded in the variety Bhima Shakti (V_7) (13.09 ^{o}B) and 30th August transplanting date (12.45^{o}B). Similarly result was found in the 2nd year variety (V_7) Bhima Shakti recorded the highest TSS (13.15 and 30th August transplanting date (12.76). The interaction effect clearly showed, the variety Bhima Shakti (V_7) transplanted on 30th August produced maximum TSS 15.05 Variety Bhima Raj exhibited the maximum TSS at transplanted on 15th September (D_2) 13.75. In the 3rd date of transplanting, variety (V_7) Bhima Shakti recorded the maximum TSS (13.13) Bhima Kiran (V_5) obtained highest TSS at 15th October transplanting date (D_4).

Discussion

The effect of transplanting dates and varieties on the bulb yield (q/ha) of *kharif* onions shows a significant variation. Research indicates that optimal transplanting dates provide favourable conditions for bulb development, directly influencing yield. The improved yield is attributed to favourable climatic conditions and reduced transplant shock during the later dates. These findings underscore the importance of synchronizing transplanting schedules with optimal growth conditions for *kharif* onions and selecting high-yielding, adaptable varieties. For detailed tables and further research specifics (Singh *et al*., 2019).

The effect of transplanting dates and onion varieties on the average bulb weight during the *kharif* season has been extensively studied. Research indicates that transplanting on later dates, such as 30th August, can significantly impact the bulb's growth parameters,

including its weight. transplanting with varieties like *Bhima raj* resulted in heavier bulb weights compared to earlier dates, likely due to better establishment and growth in later-transplanted onions during this period (Sharma *et al*., 2017). The combination of suitable transplanting dates and adaptable varieties not only increases average bulb weight but also ensures better economic returns by optimizing the crop's growth environment. These findings highlight the critical role of precise scheduling and selection of suitable onion varieties for maximizing productivity during the *kharif* season.

The number of scales in *Kharif* onion bulbs is influenced significantly by the transplanting date and the variety. Research shows that late transplanting, particularly in August, tends to favour an increased number of scales per bulb. A study in Himachal Pradesh highlighted that transplanting towards late August led to improved bulb traits, including bulb size and maturity, which are often associated with better scale development. The variety used also plays a critical role, as certain genotypes inherently exhibit higher scale numbers and better adaptation to specific planting times. For instance, varieties such as Bhima raj performed well under late August transplanting conditions, indicating their potential for higher scale numbers and better marketable bulb quality. Additionally, environmental conditions during late August favour optimal vegetative and reproductive growth in onions, contributing to enhanced scale production (Sharma *et al*., 2017).

The efficacy of transplanting dates and varieties on the polar diameter of *kharif* onion bulbs has been evaluated. Early transplanting, particularly in late August and early September, has been shown to significantly improve the polar diameter of onion bulbs. Research suggests this is due to favourable environmental conditions such as optimal temperature and day length, which promote better bulb growth and development. Delayed transplanting (e.g., mid-October) results in reduced polar diameters due to shorter growing periods and suboptimal weather conditions. Onion varieties differ significantly in their ability to produce larger polar diameters. High-performing variety *Bhima Raj* are often reported to achieve the best results when planted during optimal transplanting periods. While transplanting dates and varieties independently affect polar diameter, their interaction is typically non-significant. However, certain combinations, such as *Bhima Raj* and 30 August(D1) transplanting date are produce high polar diameter of bulb and yield (Dhar *et al*., 2019).

The equatorial diameter of *kharif* onion bulbs is influenced by transplanting dates and the choice of varieties. Early and optimal transplanting dates, such as late August (e.g., 30th August (D1), generally larger equatorial diameters due to favourable climatic conditions, such as balanced temperature and humidity during the critical growth phases of the onion bulbs. As transplanting is delayed (e.g., October), the equatorial diameter decreases. Late transplanting results in shortened growth periods, which affect bulb expansion negatively. Onion variety *Bhima Raj* exhibit significant differences in equatorial diameter. consistently produce larger bulbs under optimal transplanting conditions. Although transplanting date and variety individually affect the equatorial diameter significantly, interaction effects are generally non-significant. However, specific combinations, such as *Bhima Raj* transplanted on 30th August, achieve the best outcomes in bulb diameter (Prasad *et al*., 2021).

In the year of 2022-23 and 2023-24, interaction effect of variety Bhima Shakti and 30th August (D1) transplanting date exhibited the maximum mean value of TSS. Bharti and Ram (2015) reported that the soluble solid content of mature onion bulbs exhibited a negative linear relationship with increasing temperatures which might be the reason for decreasing TSS with later date of transplanting. Simon (1995) also demonstrated that both genetic factors and environmental conditions influence total soluble solids (TSS), which may explain the significant impact of various planting dates on TSS content observed in the present study. These findings are corroborated with the research of Prasad *et al*. (2023) and Vandna *et al*. (2024) in onion.

Conclusion

Present investigation clearly revealed that *kharif* season onion production is possible in the subtropical regions, however, transplanting on different timeas well as choice of variety had a close relation with yield and quality of bulb. It was noticed that maximum bulb yield and superior bulb quality traits were observed in transplanting on 30th August (D_1) and variety Bhima Raj, followed by Bhima Shakti in case of quality. Therefore, it can be summarized that onion cultivar Bhima Raj (V_4) can be selected followed by Bhima Shakti and transplanting date on 30th August (D_1) can be suggested for *kharif* season onion production in sub tropical climate of Lucknow.

References

Baghizadeh, A., Baniasadi F., Bonjar G.H.S., Sirchi G.R.S., Massumi H., Jorjandi M., Farokhi P.R. and Aghighi S. (2009). Biocontrol of *Botrytis allii* Munn the causal agent of neck rot, the post-harvest disease in onion, by use of

a new Iranian isolate of *Streptomyces*. *Amer. J. Agricult. Biolog. Sci.*, **4**, 72-78.

Bharti, N. and Ram R.B. (2015). Influence of planting dates and sulphur fertilization on physical and chemical traits of onion cv. Pusa Red. *Int. J. Plant Sci.*, **10 (2)**, 108-112.

Deepa Sharma and B.S. Dogra (2017).Evaluation of *kharif* onion varieties and transplanting time for production under North-Western mid Himalayan region Deepa Sharma and B.S. Dogra.Indian J. Hort. 74(3), September: 405-409.

Dhar, M., Mandal J., Maity T.K. and Smaranika Mohanta (2019). Evaluation of *kharif* onion (*Allium cepa* L.) Varieties under different planting dates. *J. Pharmacog. Phytochem.*, **8(2)**, 1317-1321.

Javadzadeh, A., Ghorbanihaghjo A., Bonyadi S., Rashidi M.R., Mesgari M., Rashtchizadeh N. and Argani H. (2009). Preventive effect of onion juice on selenite-induced experimental cataract. *Indian J. Ophthalmol*., **57**, 185-189.

Neha, Kumari Singh, Verma R.B., Kumar Vijay and Kumar Randhir (2019). Effect of Transplanting Dates and PGRS on Growth and Yield of *Kharif* Onion (*Allium cepa* L.) Under Bihar Region. *Int. J. Curr. Microbiol. App. Sci*., **8(9)**, 2377-2384.

Pandey, U.B. (1993). Onions in India. Associated Agricultural Development Foundation. Bulletin no. 5 pp. 48.

Pandita, M.L. (1994). Status of allium production and research in India. International Symposium on Alliums for the Tropics ISHS. *Acta Horticulturae*, **358**, 79-86.

Prasad, Mata, Sutanu Maji and Maya Ram (2023). Effect of dates of transplanting on bulb yield and quality of *kharif* onion cultivars. *Int. J. Minor Fruits, Medicinal and Aromatic Plants*, **9(2)**, 109-115.

Prasad, B., Maji S. and Meena K.R. (2017). Effect of date of trans- planting and mulching on growth, yield and quality of onion (*Allium cepa* L.) Cv Nasik Red. *J Appl. Nat. Sci*., **9(1)**, 94—101.

Prasad, Mata, Sutanu Maji, Maya Ram, Razauddin and Ramesh Chand Meena (2021). Performance of two cultivars of onion under different dates of transplanting as *kharif* production. *The Pharma Innov. J.*, **SP-10(12)**, 493-497.

Ratan, Das, Veere Gowda R. and Pandey Himanshu (2017). Evaluation of different Onion (*Allium cepa* L.) Genotypes for Yield and Quality Parameters in *Kharif* Season under Bengaluru condition, India. *Int. J. Curr. Microbiol. App. Sci*., **6(11)**, 2393-2398.

Sharma, Deepa and Jarial Kumud (2017). Effect of different Varieties and Planting Time on *Kharif* Onion Production in Lower Shivalik Hills of Himachal Pradesh. *Curr. Agri. Res. J*., **5(1)**, 74-80.

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

Tripathy P., Sahoo B.B., Priyadarshini A., Das S.K. and Dash D.K. (2014). Standardization of *Kharif* Onion Cultivars. *Int. J. Bio-resource Stress Manage.*, **5(2)**, 269-274.

Vandna, Sailen Gogoi, Reecha T. Das, Kumar Mukesh and Rawat Sheetal (2024). Storage Performance of various Late *kharif* Onion (*Allium cepa* L.) varieties using Three Sowing Dates in Assam. *Biological Forum – An Int. J.*, **16(8)**, 249-255.