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Effect of different Transplanting Times on Growth and Yield of Lettuce Variety Great Lakes

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Lettuce is the topmost leafy salad vegetable grown in the world. Performance of lettuce varieties varies erratically under different transplanting period. Transplanting time and climatic conditions affect the production and quality of the produce immensely. To study the effect of different transplanting time, an experiment was conducted at college farm of College of Agriculture, Navsari Agricultural University, Waghai, Dang, Gujarat in the year 2023. Experiment was laid out in RBD design with four replications. The experiment was carried out in different transplanting time viz. 3rd week of September (T_1), 1st week of October (T_2), 3rd week of October (T_3), 1st week of November (T_4), 3rd week of November (T_5) and 1st week of December (T_6). Observations were recorded for traits such as plant height, plant spread, leaf length, leaf width, number of leaves per plant, fresh

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weight of leaf, number of leaf cuttings, yield per plant and total yield per hectare. Results revealed that plant height at 30, 60 and 120 days after transplanting was significantly affected at different transplanting time. Plant spread (697.42 cm^2), leaf length (21.75 cm), leaf width (20.75 cm), number of leaf cuttings, yield per plant (371 g) and total yield (14271.30 kg/ha) were significantly higher in 3rd week of October transplanting. Plant height at 90 Days After Transplanting, number of leaves per plant and fresh weight of leaf were found non-significant.

Keywords: Lettuce; transplanting times; yield; great lakes.

1. INTRODUCTION

Lettuce (*Lactuca sativa*), a member of the sunflower family (Asteraceae), reigns supreme as the world's most important green salad (Thomas et al., 2021). "Although traditionally a minor crop in India, cultivated primarily in kitchen gardens, its popularity has surged within continental hotels. India is currently a third largest producer of Lettuce. Interestingly, India also harbours a native lettuce species, *Lactuca indica*, also known as Indian lettuce. It is found primarily in the regions of Meghalaya and Sikkim, this species holds medicinal value rather than culinary significance. Lettuce crop contains good source of dietary fibres, calcium, iron and vitamins A, B, C and E" (Singh et al., 2024). "The optimum transplanting time for maximizing yield varies with location. Temperature is one of the main factors affecting the germination and growth rate of lettuce" (Wien, 1997). Higher temperature often reduces lettuce yield and cause physiological disorders such as premature bolting, tip burn, and ribbiness (Lafta et al*.,* 2017). "Sowing time is a major factor to influence the crop yield. Earlier sowing usually result in greater crop biomass, higher risk of lodging at the end of the season and increased risk of frost damage during flowering and pod setting. The optimum sowing time for maximizing yield varies with location" (Kumar et al., 2023). "Planting dates are an important factor to influence the quantity and quality of lettuce and its varieties behave differently for growth and yield when grown under diversified temperature regimes" (Lee et al., 2019). The climatic condition of Waghai in the district of Dang is suitable for production of lettuce during winter season. Keeping in view, the significance of planting date for lettuce production, an experiment was planned with six transplanting times to find out the best one for specific location.

2. MATERIALS AND METHODS

The present research work was conducted to check the performance of lettuce variety "Great Lakes" in six different periods at college farm of College of Agriculture, Navsari Agricultural University, Waghai, Dangs in the year 2023. The experiment was laid out in Randomized Block Design with six transplanting times as treatments *viz*. T_1: 3rd week of September, T_2: 1st week of October, T_3: 3rd week of October, T_4: 1st week of November, T_5: 3rd week of November and T_6: 1st week of December. The land was prepared by giving two ploughings to bring the soil to fine tilth. Well decomposed farm yard manure was mixed in the soil @ 100 quintal per hectare at the time of field preparation. After preparation of a land, flat beds were prepared. The seeds of lettuce variety Great lakes were sown in plug trays one month prior to transplanting. Seedlings were transplanted in the main field at six different transplanting times as mentioned above. One and half month old (45 days) seedlings were transplanted in the raised beds at a spacing of 45 x 30 cm spacing. After transplanting the crop was irrigated immediately. In general, the experimental crop was irrigated at weekly interval. The lettuce experimental fields were kept clean and periodical manual weeding was performed. The crop was well monitored and cared from insect pest and diseases throughout the growing period of crop. Observations were recorded on growth parameters like plant height (cm) at 30 days interval from 30 days after transplanting, plant spread (cm) at harvest, leaf length (cm), leaf width (cm) and yield parameters like number of leaves per plant, fresh weight of leaf (g), number of leaf cuttings, yield per plant (g) and total yield (kg/ha). The collected data were statistically analyzed using analysis of variance (ANOVA).

3. RESULTS AND DISCUSSION

3.1 Plant Height

The effects of different transplanting times were found significant for plant height at 30 days after planting. Maximum plant height at 30 and 60 days after transplanting was recorded in 3rd week of September planting (T_1) which was followed

by 1st week of October (T_2). Significant influence of transplanting times on plant height was also reported by Narzul and Zannat, 2020. Plant height at 120 days after transplanting was significantly higher in 1st week of October. Lower value for plant height was recorded in 3rd week of November and 1st week of December. Maximum plant height at 3rd week of September and 1st week of October might be due to early winter transplanting promoting good vegetative growth compared to mid or late winter season. Similar result of plant height was recorded by Kaleri et al., 2016 and Thakur et al., 2017 in lettuce.

3.2 Plant Spread

The effect of transplanting times on leaf spread was found significant. Maximum plant spread (697.42 cm^2) was observed in 3rd week of October (T_3) whereas minimum (533 cm^2) was observed in 1st week of November (T_6). It may be due to late transplanting resulted in poor vegetative growth of lettuce seedlings. Significant result of different transplanting time for higher plant spread was reported by Thirupal et al., 2017 in broccoli.

3.3 Leaf Length (cm)

Significant effect of transplanting times was seen for this trait. Maximum leaf length (21.64 cm) was observed in 3rd week of October (T_3) whereas, minimum (18.10 cm) at 3rd week of September (T_1). These results are in conformity with (Kaleri et al. 2016).

3.4 Leaf Width (cm)

Maximum leaf width was found in transplanting on 3rd week of October (T_3) whereas, minimum on 3rd week of September (T_1) transplanting. It might be due to availability of suitable climatic conditions in October month resulted in maximum leaf width.

Image 1. Lettuce variety "Great Lakes"

Image 2. Cultivation of lettuce

Table 1. Effect of transplanting times on growth parameters of lettuce variety great lakes

Treatments	Plant height at 30 DATP	Plant height at 60 DATP	Plant height at 90 DATP	Plant height at 120 DATP	Plant spread (cm^2)	Leaf length (cm)	Leaf width (cm)
T_1- 3rd week of September	14.26	21.10	22.97	23.29	686.59	18.25	19.25
T_2- 1st week of October	13.17	18.16	24.01	24.26	682.54	20.25	19.50
T_3- 3rd week of October	12.56	14.73	22.41	21.89	697.42	21.75	20.75
T_4- 1st week of November	11.49	12.54	22.31	22.71	679.15	19.75	17.75
T_5- 3rd week of November	10.36	12.08	22.10	21.00	677.03	18.75	17.75
T_6- 1st week of December	9.77	15.31	23.76	20.01	533.00	17.50	16.50
S Em ±	0.49	0.56	0.84	0.80	27.06	0.73	0.78
CD at 5%	1.48	1.67	NS	2.42	81.58	2.20	2.34
CV %	8.21	7.10	7.35	7.23	8.21	7.53	8.36
*DATP= Days after transplanting							

Table 2. Effect of transplanting times on yield parameters of lettuce variety great lakes

Treatments	Number of leaves/ plant	Fresh weight of leaf (10 leaf wt.) (g)	Number of leaf cuttings	Yield/plant (g)	Total yield (kg/ha)
T_1- 3rd week of September	20.15	120.32	7.75	255.96	8250.93
T_2- 1st week of October	19.41	114.26	8.00	288.06	10956.48
T_3- 3rd week of October	21.70	120.79	9.75	371.38	14271.30
T_4- 1st week of November	20.21	117.32	8.25	312.49	12104.63
T_5- 3rd week of November	18.21	112.66	7.00	253.34	9590.19
T_6- 1st week of December	17.80	111.51	6.25	199.18	6975.93
S Em ±	0.93	4.24	0.35	16.21	631.03
CD at 5%	NS	NS	1.05	48.86	1902.11
CV %	9.50	7.30	8.93	11.58	12.18

Image 3. Yield of lettuce variety

3.5 Number of Leaves Per Plant

Among the different transplanting times, number of leaves per plant was found non-significant but higher value (21.70) was obtained in treatment of seedling transplanted in 3rd week of October. Similar results had been reported by (Brinsmead (1992) and Regan and Siddique, 2006).

3.6 Fresh Weight of Leaf

The effects of different transplanting times for fresh weight of leaf was found non-significant.

3.7 Number of Leaf Cuttings

The results indicated that the maximum number of leaf cutting (9.75) was observed at 3rd week of October transplanting whereas the minimum number of leaf cutting (6.25) was observed at 1st week of December transplanting. It might be due to late winter transplanting shortens the crop duration resulted in minimum leaf yield of lettuce crop. Similar results were obtained by Regan and Siddique, 2006.

3.8 Yield Per Plant

The effect of transplanting times was found to be significant with maximum yield per plant (371.38 g) at 3rd week of October transplanting (T_3) whereas minimum yield (199.18 g) was recorded in 1st week of December transplanting. Steingrobe and Schenk 1994 and Kaleri et al. 2016 had also reported considerable variation for yield when sown on different dates.

3.9 Total Yield (Kg/ha)

The effect of different transplanting times was found to be significant for total yield per hectare. Maximum yield of 14271 kg/ha was recorded at 3rd week of October (T_3) whereas, minimum (6975.93 kg/ha) in 1st week of November (T_6). In the current study, all the investigated parameters of the lettuce were significantly influenced by various transplanting times. The results of the present study are similar to the findings of Zani et al., (1997), Robert and Richard (2009), Zhao et al. (2000) who have also reported different responses to sowing dates. Cheng et al. (2000) reported that “under moderate temperature, the growth of lettuce varieties was smoother and more yields were achieved as compared to those planted under lower and higher temperature regimes”. The optimum sowing time for maximizing yield varies with location (Brinsmead, 1992).

4. CONCLUSION

Present study was carried out to find out suitable transplanting time for growth and yield of lettuce var. Great Lakes at college Farm, College of Agriculture, N.A.U. Waghai, The Dangs in the year 2023-24. Different six

treatments were taken in Randomized block design (RBD) with four replications. Result revealed that seedling transplanted on 3rd week of October (T_3) gave significantly higher plant spread (697.42cm^2), leaf length (21.75 cm), leaf width (20.75 cm), number of leaf cuttings (9.75), yield per plant (371.38g) and total yield (14271.30 kg ha^{-1}). From present study it can be concluded that for better growth and yield of lettuce var. Great Lakes should be transplanted at 3rd week of October (T_3) in the Waghai.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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