



Research Article

EFFECT OF SOWING DATES ON THE GROWTH AND YIELD OF LETTUCE (*LACTUCA SATIVA* L.)

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ARTICLE INFO

Article History:

Received 16th April 2016
Received in revised form
25th May 2016
Accepted 29th June 2016
Published online 31st July 2016

Keywords:

Lettuce,
Sowing Dates,
Growth,
Yield,
Lettuce.

ABSTRACT

Sowing time is one of the major factors affecting the yield of crop plants. Hence the optimum sowing time of cultivated crops needs to be investigated. A field experiment was conducted at the experimental area of the Department of Horticulture, Sindh Agriculture University Tandojam during the year 2014-15 to analyze the effects of sowing dates on the growth and yield of lettuce. The experiment was designed according to randomized complete block design with three replications. The lettuce variety Butter head was planted in a well managed plot size of 2 m x 2 m (4 m²). Growth and yield parameters of lettuce were analyzed to six sowing dates (15th Sept, 1st Oct, 15 Oct, 1st Nov, 15th Nov and 1stDecember, 2014). The results showed that there were significant differences among various sowing dates at (P<0.05) probability level. The maximum plant height (31.65 cm) was observed at 15th November and 1st December sowing dates while the maximum number of leaves plant⁻¹ (33.47, 30.80 and 30.04) was observed at 1st November, 15th November and 1st December sowing dates. Moreover, maximum marketable leaves plant⁻¹ (25.03, 24.65 and 24.58) were determined at 1st November, 1st December and 15th November sowing dates. The fresh weight of leaves plant⁻¹ (434.00 and 431.63) was observed at 1st October and 15th October, while highest yield kg ha⁻¹ (20620, 20570 and 19870 kg) was obtained at 15th November, 1st December and 1st November, respectively. On the basis of findings of the current study, it was concluded that crop sown on 15th November and 1st December showed best performance and produced maximum values for most of the investigated traits.

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INTRODUCTION

Lettuce (*Lactuca sativa* L.) is one of the popular salads crops, and also seen in various kinds of foods, such as soups, sandwiches and wraps (Hernandez *et al.*, 1992). It is annual leafy vegetable belongs to the family Compositae. Lettuce (salad) is fourth of consumption and 26th among 39 vegetables and fruits of nutritional value. It has the largest production area among salad crops in the world (Karam *et al.*, 2002). The plant is rich in minerals and vitamins with lots of fiber, which facilitates colon peristalsis. Lettuce is a good source of vitamin A and potassium, as well as a minor source of several other vitamins and nutrients (Duke *et al.*, 2007).

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The butter head lettuce has considerable nutritional value. The 100 g of lettuce contains 2.2 g carbohydrates, 1.1g dietary fiber, 0.2 g fat, 1.4 g proteins, 96 g water, 16 µg vitamin A, 73 µg Folate (Vitamin B₉), 4 mg Vitamin C and 1.2 mg Iron (Shamugavelu, 1989). Lettuce is generally grown as a hardy annual; and is easily cultivated. It requires relatively low temperatures to prevent it from flowering quickly. It can be plagued with numerous nutrient deficiencies, as well as insect and mammal pests and fungal and bacterial diseases (Davey *et al.*, 2007). World production of lettuce for calendar year 2010 stood at 23,620,000 metric tons. According to the FAO estimates (2010), China is the leading lettuce producer in the world (12,574,500 tons), followed by the United States, India, Italy, Spain and Japan with annual production of 3,954,800; 998,600; 843,344; 809,200 and 537,800 tons, respectively; while Iran, France, Turkey and Mexico produce annual lettuce production of 402,800; 398,215; 358,096 and 340, 976 tons,

respectively. Sowing time is a major factor to influence the crop yields. Lettuce yield and quality constituents are significantly affected by sowing time. Earlier sowing times 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 (Regan and Siddique, 2006). However, these risks can be outweighed by a longer growing season and subsequently higher yield potential. The optimum sowing time for maximizing yield varies with location (Brinsmead, 1992). Planting dates are important factors to influence the quantity and quality of lettuce. The lettuce varieties behave differently for growth and yield when grown under diversified temperature regimes (Gong and Gong, 1998). Lettuce cultivars when evaluated under fall planting dates by Zhao *et al.*, (2000), the different cultivars of lettuce show different reactions to sowing dates. Zani *et al.*, (1997) studied 84 lettuce cultivars under different planting dates in winter, summer and spring and response of varieties in all the seasons varied significantly for yield and resistance against biotic and abiotic factors. Robert and Richard (2009) examined the effect of sowing date on the yield of new lettuce varieties and found that varieties Cirilla, Medaillon have the highest production with 0.84, 1.49 kg m⁻² under early planting. The Cheng *et al.*, (2000) studied the effect of planting date on fall lettuce cultivars in China and found 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. In view of the facts stated above, the current study was carried out to investigate the effect of various sowing dates on the growth and yield of lettuce under Tandojam conditions.

MATERIALS AND METHODS

Experimental Layout

The present research work was conducted at the experimental area of the Department of Horticulture, Sindh Agriculture University Tandojam during the year 2014-15 to analyze the effects of sowing dates on the growth and yield of lettuce. The experiment was conducted according to Randomized Complete Block Design (RCBD) with three replications

done after the establishment of the seedlings and one seedling was maintained in each hole.

Sowing dates and assessment of traits

Six sowing dates, including 15th September, 1st October, 15th October, 1st November, 15th November, and 1st December 2014 were used in the present study. The recommended dose of nitrogen (N), phosphorous (P) and potassium were applied to the crop. The nitrogen (N) was applied in the form of urea and phosphorus (P) in the form of triple super phosphate while potash was used as sulfate of potash (K). All P and K along with one third of N was applied at the time of sowing by mixing in the soil, while the remaining N was applied in two equal split doses; after one month of sowing and the second split at one month interval. After each application of fertilizers, 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. Data were collected for the traits including plant height, number of leaves plant⁻¹, number of marketable leaves plant⁻¹, fresh weight of leaves plant⁻¹ and yield kg ha⁻¹.

Statistical analysis

The collected data were statistically analyzed using analysis of variance (ANOVA). The least Significant Difference (LSD) test was used to discriminate the superiority of treatment means by using Statistix v 8.1 computer software.

RESULTS

The results exhibited that lettuce showed significant ($P < 0.05$) response to various sowing dates. The maximum plant length (31.65 cm) was observed at 15th November and 1st December sowing date followed by (30.20cm) which was recorded at the 1st November sowing date whereas the minimum plant height (20.27 cm) was observed at 15th September, respectively (Table 1).

Table 1. Mean performance of Lettuce crop for various traits

Treatments (sowing Dates)	Plant height (cm)	Number of leaves plant ⁻¹	Number of marketable leaves plant ⁻¹	Fresh weight of leaves plant ⁻¹	Yield (kg ha ⁻¹)
15 th September	20.27 d	15.34 c	8.240 d	339.21 d	6523 e
1 st October	24.30 c	18.63 bc	18.63 c	434.00 a	12930 d
15 th October	28.52 b	21.20 b	18.58 b	431.63 a	13320. c
1 st November	30.20 ab	33.47 a	25.03 a	272.31 c	19870. a
15 th November	31.65 a	30.80 a	24.58 a	274.66 c	20620. a
1 st December	31.65 a	30.04 a	24.65 a	280.96 c	20570. a
SE	0.837	1.335	0.701	3.251	38.65
LSD 5%	2.638	4.208	2.210	10.24	121.8

Values followed by similar letters are not significantly different at the 5% probability level.

Land preparation and sowing of seeds

The land was prepared by giving 2 dry ploughings. When the land was ploughed up, the colds were crushed, and leveling was done to eradicate the weeds and to make the soil surface leveled for uniform distribution of irrigation water. After preparation of a land, ridges were prepared. The seeds of lettuce variety Butter head were sown using 3-4 seeds in each hole and thinning was

The results indicated that the maximum number of leaves plant⁻¹ (33.47, 30.80 and 30.04) was observed at 1st November, 15th November and 1st December sowing dates followed by (21.20) which was recorded at the 1st October sowing date whereas the minimum number of leaves plant⁻¹ (15.34) was observed at 15th September, respectively. The results are statistically significant among the treatments at ($P < 0.05$) probability level. The results further showed that the maximum number of marketable leaves

plant⁻¹ (25.03, 24.65 and 24.58) was observed at 1st November, 1st December and 15th November sowing date followed by (18.58) which was recorded at the 15th October sowing date, whereas the minimum number of marketable leaves plant⁻¹ (8.24) was observed at 15th September respectively.

DISCUSSION

Sowing time is a major factor to influence the crop yields. Earlier sowing times 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 (Regan and Siddique, 2006). However, these risks can be outweighed by a longer growing season and subsequently higher yield potential. The optimum sowing time for maximizing yield varies with location (Brinsmead, 1992). Planting dates are an important factor to influence the quantity and quality of lettuce also; and lettuce varieties behave differently for growth and yield when grown under diversified temperature regimes (Gong and Gong, 1998). In the current study, all the investigated parameters of the lettuce were significantly influenced by various sowing dates. The results of the present study are similar to the findings of Zani *et al.*, (1997) who studied 84 lettuce cultivars under different planting dates in winter, summer and spring and response of varieties in all the seasons varied significantly for yield and resistance against biotic and abiotic factors. Robert and Richard (2009) examined the effect of sowing dates on the yield of new lettuce varieties and found that varieties Cirilla, Medaillon have the highest production of 0.84, 1.49 kg m⁻² under early planting. Zhao *et al.* (2000) reported that different cultivars of lettuce show different responses to sowing dates. Cheng *et al.* (2000) studied the effect of planting date on fall lettuce cultivars in China and found 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.

Conclusion

It is concluded that various sowing dates significantly affected all the investigated parameters of the lettuce. However, best results were obtained when the crop was sown on 15th November and 1st December. It is therefore recommended lettuce should be grown from 15th November and 1st December.

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