J Krishi Vigyan 2023, 11 (2) : 89-92 DOI : 10.5958/2349-4433.2023.00015.6

Effect of Transplanting Dates and Locations on the Performance of Broccoli under wet temperate Himalayas

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ABSTRACT

An experiment on the effect of dates of transplanting on growth and yield of broccoli (*Brassica oleracea var. italica*) was carried out at three different locations of Seraj valley, Mandi, Himachal Pradesh. The treatment combinations comprised of three dates of transplanting *viz.,* 15th April, 30th April and 15th May and three locations *viz.,* Bajwas, Mayadhar and Jarol villages in a factorial randomized block design (FRBD) with three replications. The broccoli transplanted on 30th April recorded significantly maximum yield (214.81 q/ha) over the other dates of transplanting. Third location *viz.*, village Jarol showed significantly maximum number of non wrapper leaves, head diameter, head weight and yield. Interaction between dates of transplanting and location was significant in respect of yield per hectare. Maximum yield per hectare (215.55 q/ha) was obtained in treatment combinationL_3T_2 i.e. transplanting on 30th Aprilat village Jarol.

Key Words: Broccoli, Locations, Production, Transplanting dates, Yield

INTRODUCTION

Broccoli [*Brassica oleracea* (L.) var. *italica*] is one of the most popular exotic vegetable in India. It belongs to the family brassicaceae and is nutritionally rich vegetable and possess good amount of proteins, fibers, carbohydrates, vitamins, calcium and iron. It contains an anticancerous compound sulphoraphane. Broccoli like other cole crops prefer cool moist climatic conditions which help in the developing quality heads. It is generally grown in highland where the weather is cool or in the lowlands during the cool season (Nooprom and Santipracha, 2013). Time of sowing and transplanting are important factors influencing vegetable production. The exact time of sowing of seed in nursery and transplanted in field is essential for obtaining maximum yield along with quality of vegetable (Csizinszky, 1996).Optimum temperature for growth ranges between 18-24°C (Decoteau, 2000; Uzen and Kar, 2004). The climatic conditions of Seraj valley are suitable for its production. The weather conditions of this valley are on cooler side almost round the year and it encounter snowfall during winters. There is need to standardize suitable planting time for broccoli. Therefore, present study was aimed at promotion of high valued broccoli by identifying its optimum planting time at different locations of Seraj valley of Mandi district, Himachal Pradesh.

MATERIALS AND METHODS

The present investigation was undertaken in farmer's field at three different locations during year 2020. The experiment was laid out in RBD factorial design with three replications with plots of 1.5 m x 1.5 m size. Performance of broccoli var. Pusa KTS-1 was evaluated at three different locations viz. village Bajwas (L_1), Mayadhar (L_2), Jarol (L_3) and at three transplanting dates 15th April (T_1), 30th April (T_2), 15th May (T_3). Ten plants were selected randomly for data collection. Observations were recorded on days to head initiation, number of non

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Table 1. Effect of different locations on different horticultural traits of Broccoli var. Pusa KTS-1.

Location	Days to head initiation	Number of non wrapper leaves	Head diameter (cm)	Plant height (cm)	Head Weight (g)	Yield/ plot (kg)	Yield/ ha (q)
Bajwas (L_1)	81.42	15.45	12.17	43.96	426.81	8.54	213.41
Mayadhar(L_2)	79.68	17.47	14.12	44.32	428.22	8.56	214.11
Jarol (L_3)	78.06	17.84	15.27	45.56	428.70	8.57	214.35
$CD_{(0.05)}$	NS	0.93	NS	NS	1.66	0.03	0.83

wrapper leaves, plant height (cm), head diameter (cm), head weight (g), yield per plot (kg) and yield per hectare (q). The collected data were analyzed statistically and the means were separated by LSD.

RESULTS AND DISCUSSION

Effect of locations on broccoli

Yield and other yield contributing characters like number of non wrapper leavesand head weight were significantly influenced by the locations (Table 1). For some traits such asdays to head initiation, head diameter and plant height the effect of location was found to be non significant. Minimum days to head initiation was recorded at Jarol(L_3) whereas maximum at Bajwas (L_1). Maximum number of non wrapper leaves, head diameter, plant heightwere recorded at village Jarol(L_3), whereas minimum values for these traits were recorded at village Bajwas (L_1).

Highest per plot as well as per hectare yield (214.35q/ha) was obtained from village Jarol (L_3) and minimum (213.41q/ha) at Bajwas (L_1). Similar observations reported by Solunke *et al* (2011) and Nooprom and Santipracha (2014).

Effect of transplanting dates on broccoli

Yield and yield contributing characters of broccoli except number of non wrapper leaves were significantly influenced by different transplanting dates (Table 2). Minimum days (78.39)to head initiation were taken by transplanting on 15th May (T_3) whereas, maximum days (80.70) for head initiation were observed by transplanting on 15th April. Maximum head diameter (15.12 cm) of broccoli was obtained from 30th Aprilsowing. On the other hand, transplanting on 15th Aprilproduced the longest broccoli plant (45.69 cm) and 15th May (T_3) sowing produced minimum head diameter. The highest single head weight was recorded from 30th April (T_2) transplanting and the lowest single head weight was recorded by transplanting on15th May. Being a thermo sensitive plant, the early planted plant received comparatively low temperature during vegetative growth which produced bigger sized head. The main head yield of broccoli were significantly influenced among the three sowing time. 30th April transplanting produced the highest main head yield (214.81q/ha) and transplanting on 15th May produced the lowest main head yield (212.44 q/ha).

Combined effect of location and transplanting dates

Treatment combination of location and transplanting dates had significant effect on yield and yield contributing characters of broccoli except for days to head initiation, head diameter and plant height (Table 3). Combination of third location *i.e.,* Jarol and transplanting on 15th May had taken minimum days (76.50) to head initiation whereas, maximum days tohead initiation were taken by transplanting on 30th April at village Bajwas. Maximum number of non wrapper leaves (19.26) were observed in treatment combination L_2T_3 i.e. transplanting on 15th May at village Mayadhar and it was at par withL_3T_3 (18.64), whereas least number of non-wrapper leaves (14.43) were found in treatment

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Table 2. Effect of different transplanting dates on different horticultural traits of Broccoli var. Pusa KTS-1.

Transplanting dates	Days to head initiation	Number of non wrapper leaves	Head diameter (cm)	Plant height (cm)	Head Weight (g)	Yield/ plot (kg)	Yield/ ha (q)
15th April (T_1)	80.70	16.51	13.68	45.69	429.22	8.58	214.61
30th April (T_2)	80.07	16.81	15.12	44.74	429.63	8.59	214.81
15th May (T_3)	78.39	17.44	12.76	43.40	424.89	8.50	212.44
$CD_{(0.05)}$	1.53	NS	1.34	1.30	1.66	0.03	0.83

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combination L_1T_3 i.e. 15th May transplanting at village Bajwas. Maximum value (15.62 cm) for head diameter was observed with treatment combination $L_2T_2$30th April transplanting at village Mayadhar whereas minimum value (9.93 cm) for this trait was observed at village Bajwas when transplanted on 15th May. Maximum plant height (46.33 cm) was recorded with L_3T_2 i.e. 30th April transplanting at village jarol. Transplanting on 15th May at village Mayadhar had resulted in minimum plant height (42.47cm). Maximum head weight of 431.11g was observed with 30th April transplanting at village Jarol (L_3T_2). On the other hand transplanting on 15th May at village Bajwas resulted in minimum value of plant height (422.33g). Among different treatment combinations maximum head yield per plot (8.62 kg) as well as per hectare (215.55q) was observed under treatment combination L_3T_2 i.e. 30th April transplanting at village Jarol. This was found at par with 30th April transplanting at Bajwas(L_1T_2) and 15th April transplanting at Mayadhar (L_3T_1). Maximum yield at 30th April transplanting at village Jarol might be due to climatic suitability and availability of desired temperature which resulted in profused growth of the crop. Similar observations were observed by Saikia*et al* (2010); Hossain *et al* (2011); Karistsapol *et al* (2013).

Table3. Combined effect of location and transplanting dates on broccoli production

Location	Transplanting date	Days to head initiation	Number of non wrapper leaves	Head diameter (cm)	Plant height (cm)	Head Weight (g)	Yield/ plot (kg)	Yield/ ha (q)
Bajwas (L_1)	15th April (L_1T_1)	81.50	15.33	11.67	45.73	427.33	8.55	213.67
	30th April (L_1T_2)	81.53	16.58	14.90	43.40	430.78	8.61	215.39
	15th May (L_1T_3)	81.23	14.43	9.93	42.73	422.33	8.45	211.17
Mayadhar (L_2)	15th April (L_2T_1)	81.27	16.40	14.03	46.00	430.00	8.60	215.00
	30th April (L_2T_2)	80.33	16.76	15.62	44.50	427.00	8.54	213.50
	15th May (L_2T_3)	77.43	19.26	12.73	42.47	427.67	8.55	213.83
Jarol (L_3)	15th April L_3T_1	79.33	17.79	15.33	45.33	430.33	8.60	215.17
	30th April L_3T_2	78.33	17.10	14.87	46.33	431.11	8.62	215.55
	15th May L_3T_3	76.50	18.64	15.60	45.00	424.67	8.49	212.33
$CD_{(0.05)}$		NS	1.61	NS	NS	2.88	0.06	1.44

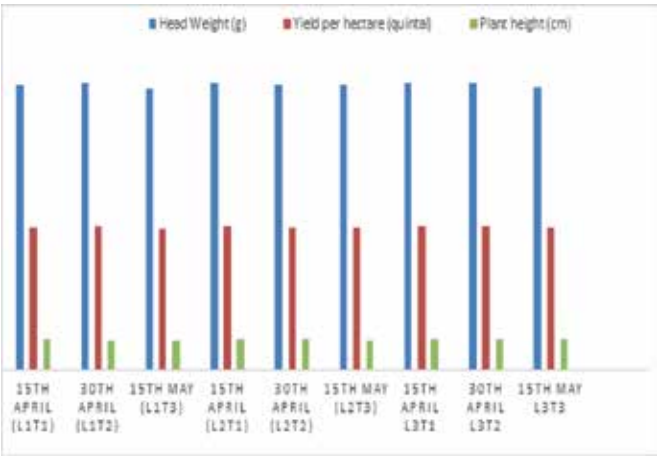


Figure1. Effect of transplanting dates on broccoli production.

CONCLUSION

Results of the present study revealed that transplanting on 30th April was the optimum time for broccoli production as it resulted in highest yield. Maximum number of non wrapper leaves, head diameter, plant heightwere recorded at village Jarol(L_3). Among different treatment combinations maximum head yield per plot (8.62 kg) as well as per hectare (215.55q) was observed under treatment combination L_3T_2 i.e. 30th April transplanting at village Jarol.

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Received on 22/3/2023 *Accepted on 30/4/2023*

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