



# Asian Journal of Plant Sciences

ISSN 1682-3974

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## Effect of Sowing Dates on Growth and Yield of Broccoli (*Brassica oleracea* L.) under Rawalakot Conditions

M. Jamil Ahmed and Wajid Siddique

Department of Horticulture, University College of Agriculture, Rawalakot, Azad Kashmir, Pakistan

**Abstract:** The present study was carried at University College of Agriculture, Rawalakot (A.K), Pakistan to find the effect of sowing dates on growth and yield of broccoli Variety, Green mountains. Seeds were sown in well-prepared seedbeds on 20th April, 5th May, 20th May and 4th June 2002. Seedlings were transplanted when 3-4 leaves were developed after 30 days. Plants for T<sub>3</sub> (Sowing on 5th May) produced more (18.48) and longer (47.31) leaves, more taller (30.79 cm) plant, heads of more diameter (14.97 cm) and weight (200.65 g), maximum secondary heads (16.0) and maximum yield (15.50 kg). Results on various parameters showed that maximum growth and yield was obtained by planting broccoli cultivar Green mountains on 5th of May. Hence, it is recommended for general cultivation of broccoli under temperate areas.

**Key words:** Broccoli, *Brassica oleracea* L., planting time, sowing dates, growth, yield, vegetative, reproductive characteristics

### INTRODUCTION

Broccoli (*Brassica oleracea* L.) is one of the most prominent vegetables grown all over the world. It is favorite crop for kitchen gardening due to its short maturation period (7-8 weeks). It belongs to Crucifereae family. It has great economic importance due to its medicinal and dietetic values since ancient times. The fresh leaves are served as salad. Broccoli is extensively used in the preparation of pickles. It has a very high nutritional value due to its high content of protein, carbohydrates, fibers, calcium, iron,  $\beta$ -carotene, thiamine, riboflavin and ascorbic acid. It also helps in digestion and assimilation of food in human body<sup>[1]</sup>.

Broccoli seeds sown in nursery and about 4-5 weeks older plants then transplanted in the soil. It requires 65-75°F temperatures at day and 50-60°F at night for 4-6 weeks period for good growth of the seedlings at the nursery. It contains cancer fighting chemical "sulforaphane" which mobilize the body natural cancer fighting resources and increase resistance to cancer<sup>[2]</sup>.

Broccoli is sown in Pakistan at small scale and its consumption is confined to big cities due to its high price and unawareness among the people.

Appropriate and proper time of sowing is one of the basic requirements for obtaining maximum yield and high return of any crop. Many experiments regarding sowing and transplanting time are being conducted in different parts of the world which revealed that total yield of the crop is markedly influenced by different sowing and transplanting times<sup>[3]</sup>.

Climatic condition of this area (Rawalakot) is well suited for its production. It was therefore planned to conduct a trial at the University College of Agriculture Rawalakot. The farmers can obtain good earning by producing this valuable crop. Keeping in view the above facts present study were carried out to find out most suitable time of sowing for broccoli under Rawalakot conditions.

### MATERIALS AND METHODS

These Studies were carried at Agriculture Research Farm, University College of Agriculture, Rawalakot Azad Kashmir, Pakistan during years 2002 to find most suitable date of sowing for broccoli. A variety Green mountains was used. The experiment was designed according to randomized complete block design (RCBD) with four treatments and three replications per treatment.

Different treatments (Sowing dates) were as under:

- T<sub>1</sub> = 20th April
- T<sub>2</sub> = 5th May
- T<sub>3</sub> = 20th May
- T<sub>4</sub> = 4th June

Land was thoroughly prepared by mixing well-rotted Farm Yard Manure @ 400 Kg ha<sup>-1</sup> with K and P @ 50 kg ha<sup>-1</sup>.

**Nursery raising:** Broccoli seeds were sown in raised nursery beds on 20th April, 5th May, 20th May and 4th

June. Seedbeds were watered early in the morning and late afternoon regularly with sprinkler till germination. Seedlings were transplanted after thirty days intervals at (3-4) leave stage. Seedlings were irrigated regularly after transplanting. Recommended doses of nitrogen (160 kg ha<sup>-1</sup>) were applied in two split doses, i.e., one half at the time of transplanting and second half at the time of head formation.

**Statistical analysis:** Data collected were statistically analyzed and factor exhibiting significant differences were subjected to Duncan's multiple range test<sup>[4]</sup> for comparison of their means.

**Data collected:** Data were collected on plant height (cm), number of leaves, leaf length, and diameter of head, weight of head (g), number of secondary heads and average yield plot<sup>-1</sup> (kg).

## RESULTS AND DISCUSSION

Present study revealed that T<sub>2</sub> produced maximum leaves per plant, i.e. 18.48 whereas T<sub>3</sub> produced (15.99) leaves plant<sup>-1</sup>. T<sub>1</sub> produced (14.35) leaves plant<sup>-1</sup>. T<sub>4</sub> was least responsive and produced minimum leaves, i.e., 12.35 plant<sup>-1</sup> (Table 1).

The number of leaves plant<sup>-1</sup> showed significant effect for different dates of sowing. Among the different treatments T<sub>3</sub> produced maximum number of leaves plant<sup>-1</sup> as compared to other treatments. Maximum number of leaves by T<sub>3</sub> was might be due to the best environmental conditions enjoyed by this treatment in the field. The most suitable temperature range for good quality and yield of broccoli is 19.22°C<sup>[5]</sup>. When seedlings of T<sub>2</sub> were transplanted in the field, average temperature remained near about 19.22°C during growth. Whereas, T<sub>4</sub> availed higher temperature (29-32°C). On the other hand T<sub>1</sub> availed comparatively lower temperature (8-14°C) during growth period.

Results for height of plant showed that T<sub>2</sub> produced taller plants, i.e., 30.79 cm whereas; T<sub>3</sub> (sowing on 20th May) produced a plant height of (28.75 cm) plant<sup>-1</sup>. Both the treatments were equal in response. T<sub>1</sub> obtained a plant height of 24.81 cm. T<sub>4</sub> produced plants of minimum height, i.e., 22.12 cm.

Height is related with the vegetative growth of the plant. T<sub>2</sub> obtained more vegetative growth as compared to the other treatments.

Results concerning leaf length showed that T<sub>2</sub> produced longer leaves, i.e., 47.31 cm, whereas, T<sub>3</sub> and T<sub>1</sub> were also equally responsive in this regard. T<sub>4</sub> produced leaves of minimum length i.e., 29.31 cm.

T<sub>2</sub> enjoyed more leaf length because of more light harvesting than late sowing T<sub>4</sub> because of cloudy weather after June<sup>[5,6]</sup>. T<sub>2</sub> obtained more head diameter i.e., 14.97 cm<sup>2</sup> than the other treatment.

T<sub>3</sub> gained a head of diameter (12.70 cm<sup>2</sup>) whereas, T<sub>1</sub> obtained a head diameter of (10.34 cm<sup>2</sup>). Minimum head diameter i.e., 8.46 cm<sup>2</sup> was obtained by T<sub>4</sub>.

Diameter of the head directly related with different dates of sowing. Maximum head diameter was produced by T<sub>2</sub> as compared to T<sub>1</sub> and T<sub>4</sub> (Table 1).

Maximum performance of T<sub>2</sub> as diameter of the head was might be due to more supply of photosynthates from the leaves. Because T<sub>2</sub> obtained more leaf size, leaf length and number of leaves as compared to all other treatments. While T<sub>4</sub> showed the minimum diameter of the head per plant due to small size and number of leaves. Results on weight of head showed that T<sub>2</sub> produced head of maximum weight (200.65 g). T<sub>3</sub> and T<sub>1</sub> obtained lower positions, respectively.

From above discussion it is clear that proper sowing time and transplanting time played an important role in achieving good yield for broccoli. These results were in agreement with the findings of Ashok *et al.*<sup>[7]</sup>, Eyffe and Titly<sup>[8]</sup>, Patil *et al.*<sup>[9]</sup>.

Results concerning secondary heads showed that T<sub>2</sub> produced significantly more heads, i.e., 16.0 whereas; T<sub>3</sub> produced lesser secondary heads, i.e., 12.0. T<sub>1</sub> showed equal response to T<sub>2</sub> and produced (10.66) heads plant<sup>-1</sup>. T<sub>4</sub> was least responsive and produced only (8.66) secondary heads per plant.

T<sub>2</sub> produced more secondary heads (16.0) because of more vigorous growth, which supply more photosynthates from leaves to the heads. By above discussion it is clear that the proper time of sowing and transplanting of broccoli is necessary for giving maximum yield and quality. These results were also in line with the findings of Diputado and Nicholas<sup>[10]</sup>.

Table 1: Effect of sowing dates on growth and yield of broccoli

Treatments	No. of leaves plant <sup>-1</sup>	Plant height (cm)	Leaf length (cm)	Diameter of head (cm)	Weight of head (g)	Secondary heads plant <sup>-1</sup>	Yield plot <sup>-1</sup> (kg)
T <sub>1</sub> (20th April)	14.35c	24.81b	42.56ab	10.34c	171.49c	10.66b	104c
T <sub>2</sub> (5th May)	18.48a	30.79a	47.31a	14.97a	200.65a	16.00a	152b
T <sub>3</sub> (20th May)	15.99b	28.75a	44.25a	12.70b	184.33b	12.00b	197a
T <sub>4</sub> (4th June)	12.35d	22.12c	39.31bc	8.46d	146.44d	8.66bc	82d

Means sharing same letters are not significant

Results on yield per plot showed that T<sub>2</sub> produced maximum yield plant<sup>-1</sup> (15.50 kg) than the other treatments. T<sub>3</sub> produced 13.4 kg yield plot<sup>-1</sup>. T<sub>1</sub> and T<sub>4</sub> produced yield, i.e., 12.8 and 11.64 kg plot<sup>-1</sup>, respectively.

Environmental factors such as light, temperature and rainfall played an important role in growth and yield of broccoli. As the light and temperature remained favorable for T<sub>2</sub>, ultimately more photosynthates were available for improvement of yield. Our results are well in collaboration with the findings of Diputado and Nicholas<sup>[10]</sup>, Patil *et al.*<sup>[9]</sup>, Swiader *et al.*<sup>[11]</sup> and Chung<sup>[12]</sup> on Cole crops.

### REFERENCES

1. Yanaguchi, M., 1983. World Vegetable Principles, Production and Nutritive Values. AVI Publishing Company, INC, Westport, Connecticut, USA., pp: 405.
2. Paul, T., 1992. Cancer protection component (Sulforaphane) abundant in broccoli sprouts. Anal. Biochem., 96: 786-798.
3. Snoek, N., 1981. How close should broccoli be planted. Greentenen Fruit, 36: 50-51.
4. Steel and Torrie, 1980. Principles and Procedures of Statistics. McGraw Hill Book Co., New York, USA., pp: 25-31.
5. Rao and Horn, 1986. Planting season dry matter production and nutritional value of *Brassica* spp., In Southern Great Plains. Progressive Hort., 13 : 115-119.
6. Bose, T.K., M.G. Som and J. Kabir, 1993. Vegetable Crops. Prentice Hall of India Private Limited New Delhi-110001, pp: 206-210.
7. Ashok, Y., P.P. Sharma and B.N. Korla, 1995. Response of Cauliflower (*Brassica oleracea* var. *Botrytis*) cultivars to different dates of planting. Hort. Sci., 7: 361-362.
8. Eyffe and Titly, 1989. Phenology studies and the prediction of harvest dates of broccoli in the Lockyer valley. Ann. Bot., 89: 841-849.
9. Patil, J.D., S. M. Ranpise and S.B. Jadhav, 1995. Effect of spacing and date of seed sowing on yield of different cultivars of cauliflower. Ind. J. Agri. Res., 22: 34-40.
10. Diputado, I. R. and M. A Nicholas, 1989. The effect of sowing dates and cultivars on the maturity characteristics of broccoli, *Brassica oleracea*, Turkish J. Agric. Forest., 22: 54-60.
11. Swiader, J.M., G.W. Ware and J.P. McCollum, 1992. Producing Vegetable Crops 4th Ed. Interstate Publisher Inc., Danville, Illinois, pp: 102-112.
12. Chung, B., 1985. The effect of sowing time and plant density on the once over harvested yield of broccoli. Japan J. Crop Sci., 54 : 413-418.