



## Effect of planting time on the performance of broccoli under Mizoram conditions

Donnie Lalfakzuala Kawlni and Chhungpuii Khawlhing\*

Department of Horticulture, Aromatic & Medicinal Plants, Mizoram University, Tanhril, Aizawl 796004, India

Broccoli (*Brassica oleracea* var. *italica*), a popular vegetable crop, has one of the most exacting climatic and cultural requirements, which limit its commercial production to a few favored locations. A field experiment was conducted at Mizoram University, Tanhril, Mizoram during winter of 2013/2014 to find out the effect of time of sowing on plant performance and yield of broccoli. Six sowing time was done viz. 17 October (T1), 24 October (T2), 31 October (T3), 7 November (T4), 14 November (T5) and 21 November (T6) with plant spacing of 45cm x 45cm. Yield and yield contributing characters were significantly influenced by the planting time. Highest average weight of marketable curd per plant (199.20 g) was obtained from T2, whereas lowest average weight obtained from T6 (75 g). The influence of planting time also showed significant difference on the calculated yield (tonnes per hectare) of broccoli, in which T2 showed highest marketable yield of 9.83 t/ha.

Received 16 December 2016  
 Accepted 11 March 2017

\*For correspondence ✉:  
[puii.kh@gmail.com](mailto:puii.kh@gmail.com)

Contact us ✉:  
[sciencevision@outlook.com](mailto:sciencevision@outlook.com)

<https://doi.org/10.33493/scivis.17.01.03>

**Key words:** Broccoli, planting time, marketable yield, Mizoram.

### Introduction

Broccoli (*Brassica oleracea* var. *italica* L.) which is a native of the Mediterranean region, is a member of the Brassicaceae family. It is one of the most important and popular winter vegetable crops in many countries of the world because of its good organoleptic properties and high nutritive value.<sup>1</sup> Broccoli has the most exacting climatic and cultural requirements, which limit its commercial production to a few favored locations.<sup>2</sup> It is considered as a cool season crop resistant to mild frost.

Broccoli cannot withstand extreme cold or

heat.<sup>3-5</sup> The temperature plays an important role on both vegetative and generative phases for its successful production. Its optimum temperature requirement is in the range of 20-25°C while the optimum temperature for curd formation is 15°-20°C.<sup>6</sup> Planting time is an important factor for broccoli production, and it differs in different regions. In Himachal Pradesh, India, the best time to plant broccoli was between 20<sup>th</sup> October and 3<sup>rd</sup> November.<sup>7</sup>

### Materials and Methods

The experiment was conducted at experimen-

tal plot of the Department of Horticulture, Aromatic and Medicinal Plants, Mizoram University, Aizawl, Mizoram during the period from October 2013 to January 2014.

Seeds of hybrid broccoli variety TSX-0788 (Tokita Seed Co. Ltd., Saitama Shi, Japan) were used for raising the seedlings. The broccoli seeds were sown in polypots in an appropriate media, with different sowing time of one week interval for each treatment. The seedlings were then transplanted after one month each to the experimental plots, and this transplanting time was accounted to be the different treatments, as

- T<sub>1</sub> – 17 October
- T<sub>2</sub> – 24 October
- T<sub>3</sub> – 31 October
- T<sub>4</sub> – 7 November
- T<sub>5</sub> – 14 November
- T<sub>6</sub> – 21 November

The trail was laid out in factorial randomized complete block design with seven replications. The field was well prepared, and rows of beds were made in which one row of plots (2.7 x 1.8 m) seven in numbers was spaced at 75 cm. Seedlings were transplanted in to each plot with the spacing of 45 x 45 cm on each bed, that consists of 6 lines having 4 plants on each line. FYM (farmyard manure) at the rate of 15 tons/ha were applied during the preparation of the main plots. In growing season, weeding was done manually as and when required. Light irrigation was given twice a day (i.e. morning and evening) during the

initial stage till the plants were well established, and later on, every alternate day. Proper insecticide sprays were given as and when required to control insects infesting the crops.

Observations were taken at 45 days, 60 days and 90 days after transplanting. Plant height, length and breadth of leaves were measured manually and expressed in centimeter (cm). Number of leaves per plant was counted on the basis of true leaves present. Weight of marketable curd was expressed in gram (g), and the weight of marketable yield was measured and expressed in tonnes/hectare (t/ha.)

The data were calculated for their means and were statistically analyzed for their least significant difference at 5% for mean separation.

## Results and Discussion

Table 1 shows a significant difference in plant height with different dates of planting. T<sub>2</sub> (24 October planting) recorded the highest average plant height on 45 dats (days after transplanting), 60 dats and 90 dats whereas lowest average plant heights were recorded from T<sub>6</sub> (21 November planting) at 45 dats and 90 dats respectively. This shows that early planting does better in terms of plant height than late planting, which may be attributed to the increase rate of photosynthesis due to exposure to optimum environmental conditions during growing season.

As shown in table 2, there is significant difference in the number of leaves recorded as affected by planting time of broccoli. Again early

**Table 1 | Plant height of broccoli with different planting time.**

Treatments	Plant height ( cm)		
	45dats	60dats	90dats
T <sub>1</sub>	13.10	14.84	17.58
T <sub>2</sub>	15.18	17.60	18.65
T <sub>3</sub>	12.90	13.24	16.92
T <sub>4</sub>	11.90	12.22	15.46
T <sub>5</sub>	10.20	11.58	13.40
T <sub>6</sub>	8.52	11.66	12.04
<b>S Em (±)</b>	<b>0.945</b>	<b>1.234</b>	<b>1.122</b>
<b>CD at 5%</b>	<b>2.794</b>	<b>3.648</b>	<b>3.315</b>

dats= days after transplanting

**Table 2 | Leaf number of broccoli with different planting time.**

Treatments	Leaf number		
	45dats	60dats	90 dats
T <sub>1</sub>	11.80	12.60	14.60
T <sub>2</sub>	13.20	13.60	15.40
T <sub>3</sub>	11.00	12.20	13.60
T <sub>4</sub>	11.00	12.60	13.20
T <sub>5</sub>	8.60	10.20	13.00
T <sub>6</sub>	6.80	8.60	10.20
<b>S Em (±)</b>	<b>1.068</b>	<b>0.954</b>	<b>0.789</b>
<b>CD at 5%</b>	<b>3.157</b>	<b>2.819</b>	<b>2.331</b>

dats= days after transplanting

Table 3 | Length of leaf (cm) of broccoli with different planting time.

Treatments	Leaf number		
	45dats	60dats	90 dats
T <sub>1</sub>	10.84	14.38	17.86
T <sub>2</sub>	7.23	12.48	19.74
T <sub>3</sub>	12.10	14.88	16.80
T <sub>4</sub>	12.54	14.42	16.20
T <sub>5</sub>	9.12	12.04	14.82
T <sub>6</sub>	9.21	11.26	13.34
<b>S Em (±)</b>	<b>0.345</b>	<b>0.587</b>	<b>1.059</b>
<b>CD at 5%</b>	<b>1.020</b>	<b>1.735</b>	<b>3.131</b>

dats= days after transplanting

Table 5 | Weight of heads (gram) of broccoli with different planting time.

Treatments	Weight of head (g)
T <sub>1</sub>	191.60
T <sub>2</sub>	199.20
T <sub>3</sub>	169.80
T <sub>4</sub>	134.60
T <sub>5</sub>	97.40
T <sub>6</sub>	75.00
<b>S Em (±)</b>	<b>4.521</b>
<b>CD at 5%</b>	<b>13.3629</b>

planting of broccoli (T<sub>2</sub>, 24 October planting) recorded highest number of leaves, whereas T<sub>6</sub> (21 November planting) recorded least number of leaves at all the observations.

Table 3 and 4 shows the length and breadth (cm) of leaves as affected by planting time. Planting in 24 October (T<sub>2</sub>) shows lowest reading of both the length and breadth of leaves at 45 days after transplanting, but this catches up with time and ultimately at 90 dats, recorded largest reading in both the cases.

There is a significant difference in head weight between broccoli planted early in the season and those planted at later dates, the highest average weight of broccoli heads were obtained from T<sub>2</sub> (199.20g) whereas lowest average weight obtained from T<sub>6</sub> (75 g). Again the influence of planting time showed significant difference on the calculated yield (tonnes per hectare) of broccoli, in which T<sub>2</sub> showed highest marketable yield of 9.83 t/ha., and T<sub>6</sub> showed

Table 4 | Leaf breadth (cm) of broccoli with different planting time

Treatments	Leaf number		
	45dats	60dats	90 dats
T <sub>1</sub>	6.78	10.82	13.46
T <sub>2</sub>	4.96	10.68	14.42
T <sub>3</sub>	7.12	11.34	13.34
T <sub>4</sub>	6.45	10.52	12.82
T <sub>5</sub>	6.75	10.14	12.70
T <sub>6</sub>	7.28	9.22	9.96
<b>S Em (±)</b>	<b>0.437</b>	<b>0.358</b>	<b>0.814</b>
<b>CD at 5%</b>	<b>1.291</b>	<b>1.059</b>	<b>2.407</b>

dats= days after transplanting

Table 6 | Calculated yield (tonnes/ha.) of broccoli with different planting time.

Treatments	Marketable Yield (t/ha)
T <sub>1</sub>	9.46
T <sub>2</sub>	9.83
T <sub>3</sub>	8.83
T <sub>4</sub>	6.64
T <sub>5</sub>	4.80
T <sub>6</sub>	3.70
<b>S Em (±)</b>	<b>0.224</b>
<b>CD at 5%</b>	<b>0.6610</b>

lowest yield with 3.70 t/ha.

Based on the results of the experiment, it can be concluded that the plant performance and yield potential of broccoli were significantly affected by the planting time, and the performance and yield drastically diminishes when planting time were delayed. It can also be suggested that the appropriate planting time of winter broccoli under Mizoram conditions should be before the end of October, as later planting show drastic diminishing rate of yield, both on marketable head and marketable yield.

## Acknowledgement

The authors are thankful to Dr Debashis Mandal, Assistant Professor, Dept. of HAMP, MZU for helping them out with data analysis.

## References

1. Dhillon BS, Tyagi RK, Saxena S & Randhaw GI (2005). *Plant Genetic Resources: Horticultural Crops*. 1<sup>st</sup> Edn., Narosa, New Delhi. p. 332.
2. Nooprom K & Santipracha Q (2013). Effect of planting dates and varieties on growth and yield of broccoli during the rainy season. *Am. J. Agric. Biol. Sci.*, 8, 357-361.
3. Christopher EP (1958). *Introductory Horticulture*. McGraw Hill Book Company Inc., New York. p. 181.
4. Shoemaker JS (1953). *Vegetable Growing*. Second edition. John Wiley and Sons Inc., New York. pp. 288-299.
5. Thompson & Kelly (1985). *Vegetable Crops*. McGraw Hill Book Co. Inc., New York. p. 296.
6. Anonymous (2001). *Handbook of Horticulture*, ICAR, New Delhi. p. 360
7. Singh AK, Khan AR & Singh A (1999). *Crop Res. (HISSAR)*, 17, 104-106.