

## Studies on effect of different cutting and varieties on growth parameter of spinach beet (*Beta vulgaris* var. *bengalensis* L.)

### Abstract

During the Rabi season, the Department of Horticulture at Babasaheb Bhimrao Ambedkar University Lucknow (U.P.) conducted research on the effect of different cuttings and varieties on the Horticulture Research Farm. The experiment was conducted in a RBD design with 16 treatments and two factor varieties (V<sub>1</sub> Chandrika, V<sub>2</sub> Pusa Jyoti, V<sub>3</sub> All Green, and V<sub>4</sub> Palak Katadar) and treatment (C<sub>0</sub> no cutting, C<sub>1</sub> cutting 1, C<sub>2</sub> cutting 2, and C<sub>3</sub> cutting 3). We found that the effect of cutting on vegetative growth parameters, viz., plant height, number of leaves, leaf length, leaf width, leaf petiole length, and germination percentage, is significant. We found that cutting C<sub>0</sub> had a significant influence on the growth parameters (plant height, number of leaves, leaf length, leaf width, and petiole length), with the minimum observed at C<sub>3</sub>, the maximum germination observed at C<sub>1</sub> as compared to C<sub>2</sub> treatment, and the least germination recorded at C<sub>0</sub> treatment. While plant height, number of leaves, leaf length, leaf width, petiole length, and germination percentage have a greater influence on Pusa jyoti (V<sub>2</sub>) than on All Green (V<sub>3</sub>), minimums are reported for Chandrika (V<sub>1</sub>). Find that combination V<sub>2</sub>C<sub>3</sub> getting maximum green yield per unit area and per unit time.

**Keywords:- Cutting, Varieties, spinach beet, Experiment, RBD.**

### Introduction

Spinach beet (*Beta vulgaris* var. *bengalensis* L.) is one of the most important leafy vegetables in the winter. Indian spinach belongs to the "Chenopodiaceae" family and originated in the Indo-Chinese region. The leafy vegetables have the highest nutritional value than other leafy vegetable Fageria et al. [1]. Spinach beet rich in minerals and hence can be called "mines of minerals." It is one of the most nutritious leafy vegetable crops in tropical and sub-tropical regions. Spinach is a rich source of Vitamin A (9770 IU) and Vitamin C (70 mg/100 g). Spinach is high in nutrients. It has 3.4 g of protein, 0.8 g of fat, 380mg of calcium, 30 mg of potassium, and 16.2 mg of iron Singh [2]. Spinach leaves are valued for their medicinal properties and used to treat inflammation, paralysis, headaches, and earaches, as well as spleen and liver diseases.

The popular spinach beet growing states include Uttar Pradesh, West Bengal, Maharashtra, and Gujarat. However, it is not very popular in south India and is primarily used as a pot herb. In Bengal leaves of this crop might have been first used and hence it is known as *B. vulgaris* var. *bengalensis*.

Spinach Beet is cultivated for fresh, green leaves, which become ready to harvest in about 30 to 35 days from sowing. Most leafy vegetables can be cut multiple times and require

a lot of fertilizer to keep up with their fast growth Wang et al. [22]. To increase yield per unit area and per unit time, a farmer found maximum leaves by increasing cutting in a specific variety. The goal of our research is to find the best combination of varieties that produce the most cutting in order to maximize yield.

## Materials and methods

### Study site

The experiment was conducted on Horticultural Research Farm-1, Babasaheb Bhimrao Ambedkar University, Lucknow, 226 025 (U.P.), during the Rabi season of 2019-20. Weather data were reported by the IISR. The maximum temperature in the summer is (43<sup>0</sup>C) and the minimum temperature in the winter is (2<sup>0</sup>C). The soil at the experiment field is sandy loam that and slightly alkaline.

### Sampling

Four varieties (Chandrika (V<sub>1</sub>), Pusa Jyoti (V<sub>2</sub>), All Green (V<sub>3</sub>), and Palak Katadar (V<sub>4</sub>) and three cuttings (no cutting (C<sub>0</sub>), cutting 1 (C<sub>1</sub>), cutting 2 (C<sub>2</sub>), and cutting 3 (C<sub>3</sub>)) in a factorial RBD design were used for the experiment. With 16 treatments and 3 replications.

### Treatment and biometric measure

These treatment combination: zero cutting + Chandrika, zero cutting + Pusa Jyoti, zero cutting + All Green, zero cutting + Palak Katadar, one cutting + Chandrika, one cutting + Pusa Jyoti, one cutting + All Green, one cutting + Palak Katadar, two cutting + Chandrika, two cutting + Pusa Jyoti, two cutting + All Green, two cutting + Palak Katadar, three cutting + Chandrika, three cutting + Pusa Jyoti.

Crops are sown on 10 November 2019 during the Rabi season. Dendrometric data was recorded in growth attributes:- plant height (cm), number of leaves, leaf length (cm), leaf width (cm), leaf petiole length (cm), and germination percentage (%).

### Statistical analysis

A statistical analysis of data obtained in different sets of experiments was calculated following the standard procedure of Panse and Sukhatme [15].

## Results and discussion

### Effect of cutting:

#### On growth parameter

Data recorded for growth attributes at regular intervals of 30, 50, and 70 DAS are shown in Table-1. Growth attributes influenced significantly cutting at 70 DAS, viz., plant height, and number of leaves, leaf length, width of leaves, and length of petiole. Maximums of parameters were recorded in the control (plant height (49.11cm), number of leaves (24.33cm), leaf length(12.49cm), width of leaves (7.09cm), and length of petiole(7.09cm) While minimum were reported at growth attributes (plant height, number of leaves, leaf length, width of leaves, and length of petiole) C<sub>3</sub> (three cutting) respectively (18.29 cm), (14.17 cm), (8.78 cm), (4.99 cm), and (4.99 cm) similar result found Singh et al. [13], and Naik et al. [17].

Maximum germination was observed for C<sub>1</sub> (78.87 %) treatment followed by the C<sub>2</sub> (78.04 %) treatment and minimum germination was reported for C<sub>0</sub> (74.96%).

#### Effect of varieties on growth parameter

Data recorded for growth attributes at regular intervals of 30, 50, and 70 DAS are shown in Table -1. varieties also significantly influence growth attributes viz., plant height, number of leaves, leaf length, width of leaves, and length of petiole, showed that V<sub>2</sub> (32.17 cm) recorded maximum height and minimum height was recorded in variety V<sub>1</sub> (29.13 cm) at 70DAS. The maximum number of leaves per plant was observed for V<sub>2</sub> (19.58) and V<sub>3</sub> (18.33). The minimum was reported in V<sub>1</sub> (16.83) at 70 DAS. The length of leaves V<sub>2</sub> (Pusa joyti 11.31cm) was maximum as and minimum was recorded V<sub>1</sub> (9.75 cm) at 70DAS. The highest width of leaves recorded in V<sub>2</sub> and V<sub>3</sub> (6.05 cm). The minimum was reported in V<sub>1</sub> at 70DAS. The maximum length of petioles was recorded in V<sub>2</sub> (Pusa Jyoti) the minimum recorded in V<sub>1</sub> (Chandrika). While in germination Pusa Jyoti recorded the highest germination and Chandrika V<sub>1</sub> (75.86%) least germination. These results are in concordance with these Singh et al. [13].

#### Interactions effect on growth parameters

Combining effect of cutting and varieties at 70DAS on growth attributes plant height (52.14 cm) and minimum C<sub>0</sub>V<sub>2</sub> C<sub>2</sub>V<sub>1</sub> (17.70 cm). And C<sub>0</sub>V<sub>2</sub> had the highest number of leaves per plant (27.67), and C<sub>2</sub>V<sub>1</sub>, C<sub>3</sub>V<sub>1</sub> had the lowest number of leaves (14.000 leaves/plant). C<sub>0</sub>V<sub>2</sub> combination maximum length of leaves (14.68 cm) and minimum C<sub>3</sub>V<sub>1</sub> (8.58cm). Width of leaves maximum C<sub>0</sub>V<sub>3</sub> (7.22 cm) and minimum C<sub>3</sub>V<sub>1</sub> (4.80 cm). And in length of petiole maximum C<sub>0</sub>V<sub>2</sub> (8.03cm) and minimum reported C<sub>3</sub>V<sub>1</sub> (4.80 cm). And in case of germination maximum germination C<sub>1</sub>V<sub>2</sub> (80.04%) and minimum germination recorded C<sub>0</sub>V<sub>1</sub> (72.71 cm) Similar results were also reported by Kasture et al. [11] and Singh et al. [13].

**Table-1**Effect of different cutting and varieties on growth parameter.

Treatments	Plant height (cm)			Number of leaves			Length of leaves (cm)		
	30DAS	50DAS	70DAS	30DAS	50DAS	70DAS	30DAS	50DAS	70DAS
V <sub>1</sub> (Chandrika)	17.28	22.32	29.13	10.50	14.17	16.83	7.66	10.59	9.57
V <sub>2</sub> (Pusa Jyoti)	20.78	25.29	32.17	12.17	17.25	19.58	8.42	11.99	11.31
V <sub>3</sub> (All Green)	19.85	23.86	31.44	11.58	16.00	18.33	8.09	11.54	10.71
V <sub>4</sub> (Palak Katadar)	19.14	23.42	30.46	11.00	15.67	17.83	7.99	11.13	10.49
SEm(±)	0.23	0.16	0.19	0.25	0.19	0.21	0.14	0.19	0.19
CD at 5%	0.68	0.46	0.54	0.73	0.56	0.60	0.42	0.55	0.56
<b>Cutting</b>									
C <sub>0</sub> (No Cutting)	18.25	35.30	49.11	10.67	18.92	24.33	7.39	12.13	12.49
C <sub>1</sub> (One Cutting)	19.84	19.95	37.41	11.83	14.33	19.83	8.68	10.83	11.16
C <sub>2</sub> (Two Cutting)	19.45	20.05	18.38	11.67	15.00	14.25	8.43	11.38	9.82
C <sub>3</sub> (Three Cutting)	19.48	19.60	18.29	11.08	14.83	14.17	7.65	10.83	8.78
SEm(±)	0.23	0.16	0.19	0.25	0.19	0.21	0.14	0.19	0.19
CD at 5%	0.68	0.46	0.54	0.73	0.56	0.60	0.42	0.55	0.56

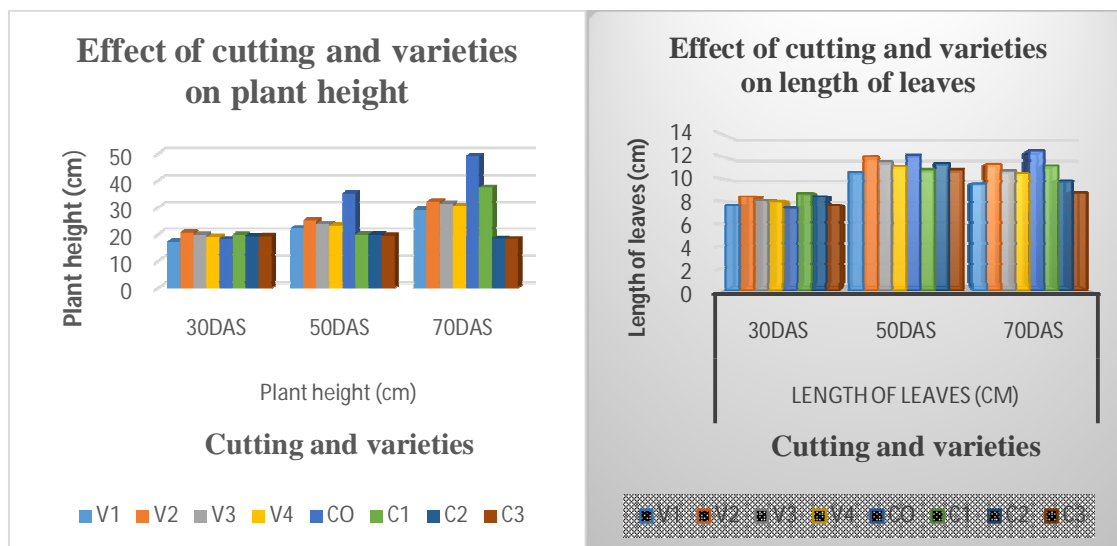
**Table-2 Effect of different cutting and varieties on growth parameter.**

Treatments	Width of leaves (cm)			leaf petiole length (cm)			Germination (%)
	30DAS	50DAS	70DAS	30DAS	50DAS	70DAS	
V <sub>1</sub> (Chandrika)	5.16	5.50	5.49	5.30	6.24	5.49	75.86
V <sub>2</sub> (Pusa Jyoti)	5.82	6.57	6.51	6.38	7.30	6.51	78.49
V <sub>3</sub> (All Green)	5.47	6.32	6.05	6.03	6.83	6.05	77.41
V <sub>4</sub> (Palak Katadar)	5.35	6.16	5.85	5.72	6.54	5.85	76.73
SEm(±)	0.14	0.19	0.18	0.15	0.16	0.36	0.17
CD at 5%	0.40	0.54	0.52	0.42	0.45	0.53	0.50
<b>Cutting</b>							
C <sub>0</sub> (No Cutting)	4.70	6.61	7.09	4.67	7.40	7.09	74.96
C <sub>1</sub> (One Cutting)	5.81	5.76	6.21	6.84	6.16	6.21	78.87
C <sub>2</sub> (Two Cutting)	5.73	6.53	5.59	6.12	7.20	5.59	78.04
C <sub>3</sub> (Three Cutting)	5.57	5.64	4.99	5.80	6.15	4.99	76.62
SEm(±)	0.14	0.19	0.18	0.15	0.16	0.36	0.17
CD at 5%	0.40	0.54	0.52	0.42	0.45	0.53	0.50

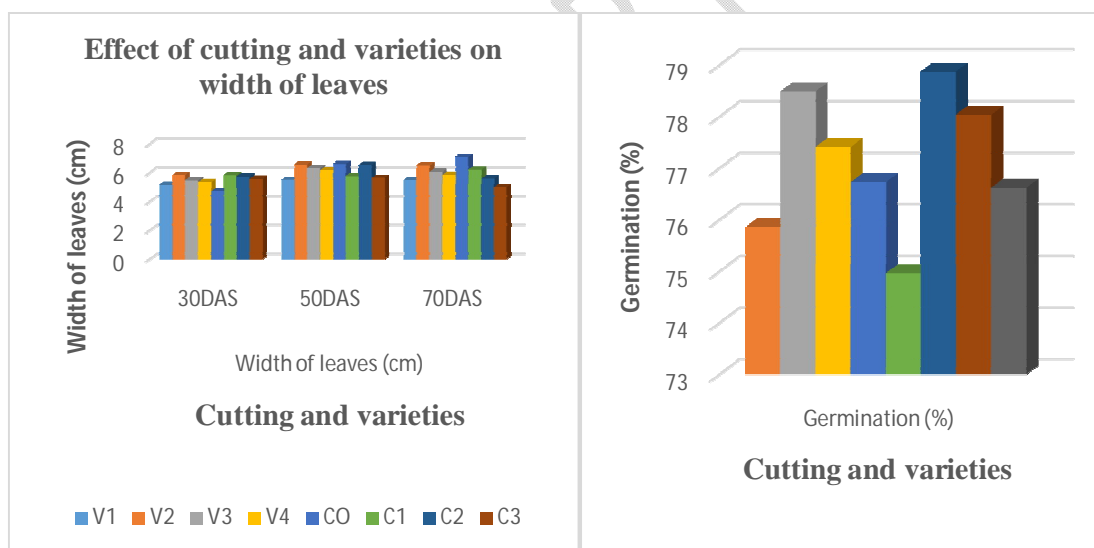
**Table-3 Interaction effect different cutting and varieties on growth of palak.**

Treatments	Plant height (cm)			Number of leaves			Length of leaves (cm)		
	30DAS	50DAS	70DAS	30DAS	50DAS	70DAS	30DAS	50DAS	70DAS
C <sub>0</sub> V <sub>1</sub> Zero cutting + Chandrika	14.04	32.29	44.09	8.67	14.33	19.33	6.83	10.86	9.89
C <sub>0</sub> V <sub>2</sub> Zero cutting + Pusa Jyoti	21.39	37.77	52.14	11.67	22.67	27.67	7.75	13.01	14.68
C <sub>0</sub> V <sub>3</sub> Zero cutting + All Green	19.60	36.02	51.71	11.33	19.67	25.33	7.53	12.35	13.06
C <sub>0</sub> V <sub>4</sub> Zero cutting + Palak Katadar	17.98	35.12	48.51	11.00	19.00	25.00	7.46	12.30	12.34
C <sub>1</sub> V <sub>1</sub> One cutting + Chandrika	17.97	19.03	36.84	11.67	14.00	20.00	8.26	10.06	10.83
C <sub>1</sub> V <sub>2</sub> One cutting + Pusa Jyoti	21.28	21.01	38.25	12.33	14.67	20.33	9.23	11.69	11.58
C <sub>1</sub> V <sub>3</sub> One cutting + All Green	20.33	20.10	37.56	12.00	14.33	19.67	8.68	11.39	11.15
C <sub>1</sub> V <sub>4</sub> One cutting + Palak Katadar	19.78	19.65	37.01	11.33	14.33	19.33	8.57	10.19	11.09
C <sub>2</sub> V <sub>1</sub> Two cutting + Chandrika	18.29	19.12	17.70	10.67	14.33	14.00	8.24	10.93	9.68
C <sub>2</sub> V <sub>2</sub> Two cutting + Pusa Jyoti	20.38	21.39	19.13	12.67	16.00	15.33	8.85	11.78	9.92
C <sub>2</sub> V <sub>3</sub> Two cutting + All Green	19.85	20.03	18.37	12.00	15.00	14.00	8.34	11.60	9.82
C <sub>2</sub> V <sub>4</sub> Two cutting + Palak Katadar	19.29	19.64	18.33	11.33	14.67	13.67	8.29	11.22	9.87
C <sub>3</sub> V <sub>1</sub> Three cutting + Chandrika	18.85	18.85	17.88	11.00	14.00	14.00	7.31	10.49	8.58
C <sub>3</sub> V <sub>2</sub> Three cutting + Pusa Jyoti	20.06	21.00	19.16	12.00	15.67	15.00	7.86	11.18	9.06
C <sub>3</sub> V <sub>3</sub> Three cutting + All Green	19.61	19.29	18.13	11.00	15.00	14.33	7.76	10.84	8.82
C <sub>3</sub> V <sub>4</sub> Three cutting + Palak Katadar	19.41	19.26	18.00	10.33	14.67	13.33	7.66	10.80	8.65





**Figure-1.** Showed effect of cutting and varieties on plant height and length of leaves.



**Figure-2.** Showed effect of cutting and varieties on width of leaves and germination (%).

**Conclusion:**

**In conclusion** for getting maximum green yield of Palak var. Pusa Jyoti at three leaf cutting is better means V<sub>2</sub>C<sub>3</sub> combination for production per unit area and per unit time.

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