

# Effect of different mulching and irrigation scheduling on agronomical parameters of bokchoy

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■ **ABSTRACT** : A field experiment was conducted to study the Bokchoy productivity under drip irrigation with different mulching at Mhasrul farm of K. K. Wagh College of Agricultural Engineering and Technology, Nashik during February 2018 to March 2018. The experiment was laid out in Randomized Block Design with six treatments. In the experiment, the maximum yield was obtained from plastic mulch with 100 per cent irrigation treatment (270 g) while minimum yield was obtained from without mulch with 100 per cent irrigation treatment (40 g). Maximum height measured at harvesting time was from plastic mulch treatment with 100 per cent irrigation (26 cm) while minimum height was obtained from without mulch with 100 per cent treatment (15cm). Maximum number of leaves (16) was observed in without mulch treatment with 100 per cent irrigation treatment and minimum leaves in without mulch with 80 per cent irrigation treatment (10 cm).

■ **KEY WORDS** : Number of branches, Height of plants, Number of leaves

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**B**okchoy, also known as Pak choi or Spoon cabbage. Bokchoy is one of the most popular Chinese leafy green. Scientific name of bokchoy is *Brassica rapa* belongs to Crucifer family.

Bokchoy is low in calories, but still packs a nutritional punch, containing high amounts of vitamin-C and source of vitamin-K. It is effective on bone health and prevention of osteoporosis. It improves immune response and decrease inflammation. Bokchoy is used to make recipes like Chinese greens, fried rice etc.

Mulch is any type of material that is spread or laid over the surface of the soil as a covering. It is used to retain the moisture in the soil, suppresses weed, keep the soil cool and make the garden bed look more attractive. Organic mulches also improves the soil fertility, as they decompose. The mulch is usually, but not exclusively,

organic in nature. It may be permanent (e.g. plastic sheeting) or temporary (e.g. bark chips). Materials used for mulches are crop residues, leaves, clippings, bark manure, paper, plastic films, petroleum products, gravels etc. Plastic films are more widely used as mulch (Ankush *et al.*, 2017; Basavraj and Durairaj, 2016 and Cooney *et al.*, 2016). They help in maintaining higher water content in soil resulted from reduced evaporation, induced infiltration, reduced transpiration from weeds or combination of all these factors.

Irrigation must be scheduled according to water availability and crop need. If adequate water supplies are available, irrigation are usually provided to obtain optimum or maximum yield, however, over irrigation should be avoided as this can decrease yield by reducing soil aeration and increasing leaching fertilizer while

increasing water and energy cost. The amount of water lost by evapotranspiration can be estimated by climatological data or from a pan evaporation reading in scheduling of irrigation. By this approach, the irrigation interval is fixed as two or three days and irrigation can be applied based on crop evapotranspiration values (Ankush *et al.*, 2017; Basavraj and Durairaj, 2016 and Cookey *et al.*, 2016).

## METHODOLOGY

### Site selection:

The experiment was carried out on the Mhasrul farm of K. K. Wagh College of Agricultural Engineering and Technology, Panchvati, Nashik during summer season of 2018. Nashik is situated at north region of Maharashtra. It is situated at an altitude of 700 m above mean sea level (MSL). The type of soil on the Mhasrul farm is black cotton.

### Materials:

The materials used were mulching paper (16 micron), laterals (16mm), emitters (4lph), flow control valves (16 mm), joiners (16 mm), seedlings, organic mulch *i.e.* wheat straw, end caps (Cookey *et al.*, 2016; Decoteau *et al.*, 1990; Hutton and Handley, 2005; Khan *et al.*, 2005; McMillen, 2013 and Nyajeka *et al.*, 2017).

Main line conveyed irrigation water from the head unit to the sub main. A PVC pipe of 63 mm diameter and 1 kg/cm<sup>2</sup> pressure were used. Inline drippers of 4 lph discharge rate at 1.0 kg/cm<sup>2</sup> pressure were connected with spacing of 35 cm between two drippers. Pressure gauge was used to measure the pressure developed in the network of irrigation pipelines.

In water distribution unit tees, elbows, end caps and flow control valves were used. Water from the main line delivering to sub main was controlled with the help of flow control valve. Threaded end cap was used at end of sub main. End plug was used to close the end of the lateral (Cookey *et al.*, 2016; Decoteau *et al.*, 1990; Hutton and Handley, 2005; Khan *et al.*, 2005; McMillen, 2013 and Nyajeka *et al.*, 2017)..

### Crop water requirement:

It is the amount of water required by the plant from the time of its sowing to the time of its harvesting for its full growth. It can be calculated by using following formula (Salam and Mazrooei, 2006):

$$CWR = \frac{\text{Crop area} \times PE \times K_p \times K_c \times \% \text{ wetted area}}{Eu}$$

where,

Crop area = Row to row spacing (m) × plant to plant spacing between plants (m), m<sup>2</sup>

PE = Cumulative pan evaporation of the region, mm/day

K<sub>p</sub> = Pan co-efficient

K<sub>c</sub> = Crop co-efficient, value depends on growth stage of crop

% wetted area = It is area which depend on crop canopy cover

Eu = Emission uniformity, for drip irrigation it is taken as 0.9.

### Observations to be taken:

– Height of bokchoy was measured at 7 days

Table A : Treatments details	
Treatments	Specification
T <sub>1</sub>	100% water with black polyethylene mulch with drip irrigation
T <sub>2</sub>	80% water with black polyethylene mulch with drip irrigation
T <sub>3</sub>	100% water with organic mulch with drip irrigation (wheat straw)
T <sub>4</sub>	80% water with organic mulch with drip irrigation (wheat straw)
T <sub>5</sub>	100% water without mulch with drip irrigation (control)
T <sub>6</sub>	80% water without mulch with drip irrigation (control)

Table B : Experimental details (Cookey <i>et al.</i> , 2016; Decoteau <i>et al.</i> , 1990; Hutton and Handley, 2005; Khan <i>et al.</i> , 2005; McMillen, 2013 and Nyajeka <i>et al.</i> , 2017)		
Sr. No.	Particulars	Specification
1.	Name of the crop	Bokchoy
2.	Scientific name	<i>Brassica rapa</i>
3.	Planting time	Summer
4.	Design	Randomized Block Ddesign
5.	Number of treatments	6
6.	Plot size	9m × 6m
7.	Crop spacing	0.60 × 0.45 m
8.	Number of plants per row	39
9.	Duration of crop	60 days
10.	Mulches used	Plastic mulch and organic mulch

interval during entire base period.

- Number of leaves were measured at 7 days interval during entire base period.
- Weight of bokchoy per row was taken after harvesting.

## ■ RESULTS AND DISCUSSION

The experiment was conducted at Mhasrul farm of K. K. Wagh College of Agricultural Engineering and Technology, Nashik. Growth parameters and yield parameters were compared with respect to treatment followed and mulches used.

### Weight of bokchoy:

Weight of bokchoy per row was taken after harvesting. Five plants per treatment were selected for observations. The position of plants in each treatment was taken as same. The results of the weights obtained are tabulated in Table 1.

From the Fig. 1, we observed that the maximum average weight of bokchoy was obtained in the plastic mulching with 100 per cent irrigation treatment and maximum average weight was 194 g. The individual maximum weight observed was 270 g for the same treatment *i.e.* for plastic mulching with 100 per cent irrigation. The minimum average weight was observed

in the treatment without mulch with 80 per cent irrigation and minimum average weight observed was 70 g. The minimum individual weight was also observed in the treatment without mulch with 80 per cent irrigation and it was 40 g.

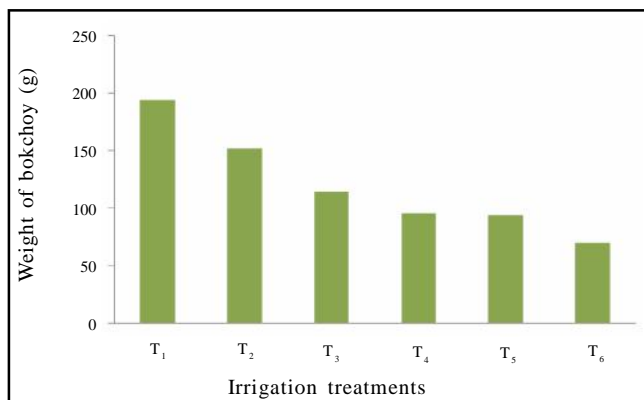


Fig. 1 : Average weight of bokchoy after harvesting against treatments

### Height of bokchoy:

Height of bokchoy per row was measured at 7 days interval during the whole base period. Five plants per treatment were selected for observations. The position of plants in each treatment was taken as same. The

Plant No.	T <sub>1</sub> (g)	T <sub>2</sub> (g)	T <sub>3</sub> (g)	T <sub>4</sub> (g)	T <sub>5</sub> (g)	T <sub>6</sub> (g)
3 <sup>rd</sup>	260	270	90	110	90	80
6 <sup>th</sup>	180	100	100	90	120	50
16 <sup>th</sup>	150	160	140	80	40	70
24 <sup>th</sup>	160	130	140	100	100	70
29 <sup>th</sup>	210	110	100	100	120	80

Plant No.	1 <sup>st</sup> time		2 <sup>nd</sup> time		3 <sup>rd</sup> time		4 <sup>th</sup> time		5 <sup>th</sup> time	
	T <sub>1</sub> (cm)	T <sub>2</sub> (cm)	T <sub>1</sub> (cm)	T <sub>2</sub> (cm)	T <sub>1</sub> (cm)	T <sub>2</sub> (cm)	T <sub>1</sub> (cm)	T <sub>2</sub> (cm)	T <sub>1</sub> (cm)	T <sub>2</sub> (cm)
3 <sup>rd</sup>	4	7	6	10	12	15	22	23	26	24
6 <sup>th</sup>	7	3	11	5	16	10	24	19	24	21
16 <sup>th</sup>	7	4	11	7	15	12	23	20	24	21
24 <sup>th</sup>	6	5	9	9	13	13	22	21	24	22
29 <sup>th</sup>	7	5	11	8	16	12	24	20	24	21
F cal.	14.8573									
S.E.±	0.5499									
C.D. (P=0.05)	1.1472									

results of the heights obtained are tabulated in the given tables.

**Height of bokchoy with plastic mulching:**

The results of the heights of bokchoy with plastic mulching are tabulated in Table 2.

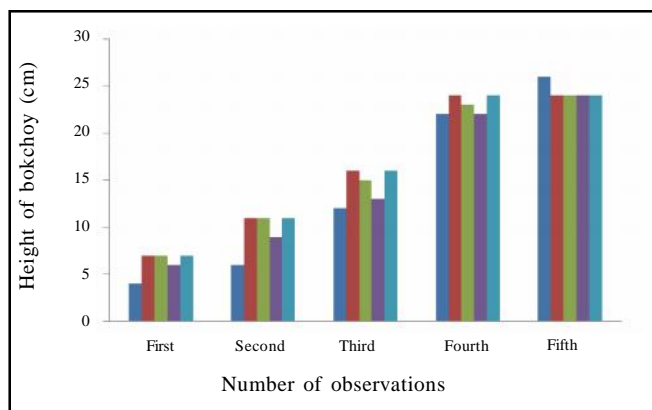
**Height of bokchoy in treatment T<sub>1</sub>:**

In treatment plastic mulching with 100 per cent irrigation, height of plants increases day by day which is recorded five times after seven days interval. The maximum height observed in first observation was 7 cm and minimum height observed in the first observation was 4 cm. The maximum height observed in second observation was 11 cm and minimum height observed in the second observation was 6 cm. The maximum height observed in third observation was 16 cm and minimum height observed in the third observation was 12 cm. The maximum height observed in fourth observation was 24

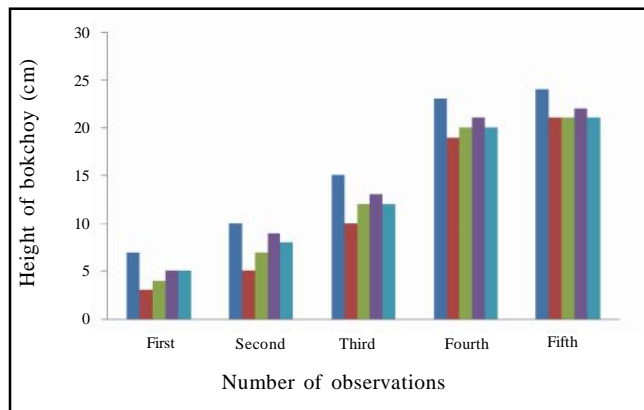
cm and minimum height observed in the fourth observation was 22 cm. The maximum height observed in fifth observation was 26 cm and minimum height observed in the fifth observation was 24 cm.

**Height of bokchoy in treatment T<sub>2</sub>:**

In the treatment plastic mulching with 80 per cent irrigation, height of plants increases day by day which is recorded five times after seven days interval. The maximum height observed in first observation was 7 cm and minimum height observed in the first observation was 3 cm. The maximum height observed in second observation was 10 cm and minimum height observed in the second observation was 5 cm. The maximum height observed in third observation was 15 cm and minimum height observed in the third observation was 10 cm. The maximum height observed in fourth observation was 23 cm and minimum height observed in the fourth observation was 19 cm. The maximum height observed



**Fig. 2 :** Height of bokchoy in treatment T<sub>1</sub> at different observations



**Fig. 3 :** Height of bokchoy in treatment T<sub>2</sub> at different observations

Table 3 : Height of bokchoy with organic mulching											
Plant No.	1 <sup>st</sup> time		2 <sup>nd</sup> time		3 <sup>rd</sup> time		4 <sup>th</sup> time		5 <sup>th</sup> time		
	T <sub>3</sub> (cm)	T <sub>4</sub> (cm)	T <sub>3</sub> (cm)	T <sub>4</sub> (cm)	T <sub>3</sub> (cm)	T <sub>4</sub> (cm)	T <sub>3</sub> (cm)	T <sub>4</sub> (cm)	T <sub>3</sub> (cm)	T <sub>4</sub> (cm)	
3 <sup>rd</sup>	4	4	7	7	11	11	19	18	24	20	
6 <sup>th</sup>	3	5	6	8	10	11	16	19	18	22	
16 <sup>th</sup>	3	4	5	7	10	10	17	17	20	20	
24 <sup>th</sup>	5	6	9	8	12	12	20	19	24	20	
29 <sup>th</sup>	4	5	7	8	12	12	18	22	21	22	
F cal.					14.8573						
S.E.±					0.5499						
C.D. (P=0.05)					1.1472						

in fifth observation was 24 cm and minimum height observed in the fifth observation was 21 cm.

**Height of bokchoy with organic mulching:**

The results of the heights of bokchoy with organic mulching are tabulated in Table 3.

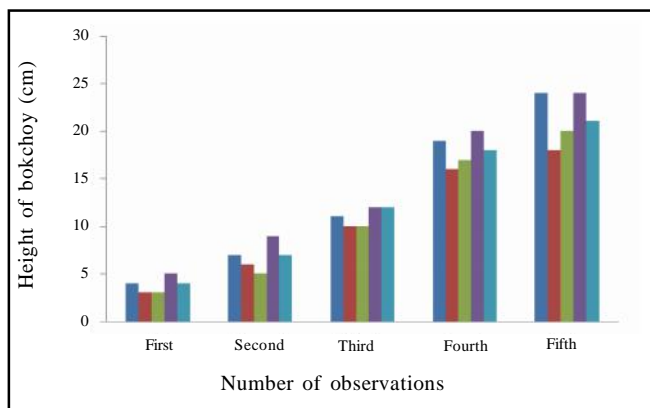
**Height of bokchoy in treatment T<sub>3</sub>:**

In the treatment organic mulching with 100 per cent irrigation, height of plants increases day by day which is recorded five times after seven days interval. The maximum height observed in first observation was 5 cm and minimum height observed in the first observation was 3 cm. The maximum height observed in second observation was 9 cm and minimum height observed in the second observation was 5 cm. The maximum height observed in third observation was 12 cm and minimum height observed in the third observation was 10 cm. The maximum height observed in fourth observation was 20

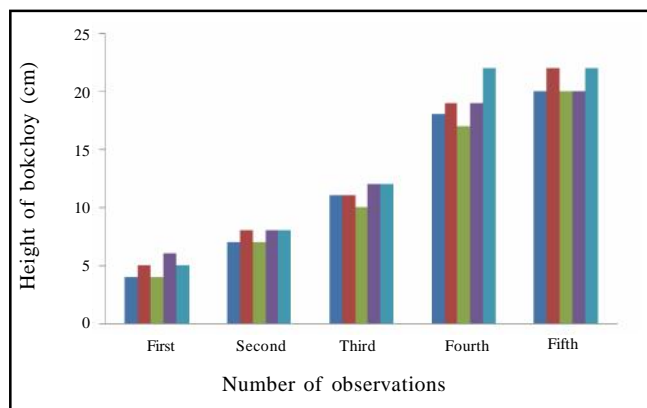
cm and minimum height observed in the fourth observation was 16 cm. The maximum height observed in fifth observation was 24 cm and minimum height observed in the fifth observation was 18 cm.

**Height of bokchoy in treatment T<sub>4</sub>:**

In the treatment organic mulching with 80 per cent irrigation, height of plants increases day by day which is recorded five times after seven days interval. The maximum height observed in first observation was 6 cm and minimum height observed in the first observation was 4 cm. The maximum height observed in second observation was 8 cm and minimum height observed in the second observation was 7 cm. The maximum height observed in third observation was 12 cm and minimum height observed in the third observation was 10 cm. The maximum height observed in fourth observation was 22 cm and minimum height observed in the fourth observation was 17 cm. The maximum height observed



**Fig. 4 :** Height of bokchoy in treatment T<sub>3</sub> at different observations



**Fig. 5 :** Height of bokchoy in treatment T<sub>4</sub> at different observations

Plant No.	1 <sup>st</sup> time		2 <sup>nd</sup> time		3 <sup>rd</sup> time		4 <sup>th</sup> time		5 <sup>th</sup> time	
	T <sub>5</sub> (cm)	T <sub>6</sub> (cm)	T <sub>5</sub> (cm)	T <sub>6</sub> (cm)	T <sub>5</sub> (cm)	T <sub>6</sub> (cm)	T <sub>5</sub> (cm)	T <sub>6</sub> (cm)	T <sub>5</sub> (cm)	T <sub>6</sub> (cm)
3 <sup>rd</sup>	3	5	5	9	9	11	16	17	19	22
6 <sup>th</sup>	4	4	7	8	10	10	17	16	15	17
16 <sup>th</sup>	5	3	8	5	11	9	18	16	18	19
24 <sup>th</sup>	5	5	8	8	11	10	16	16	23	20
29 <sup>th</sup>	4	6	7	10	10	13	15	18	18	22
F cal.					14.8573					
S.E.±					0.5499					
C.D. (P=0.05)					1.1472					

in fifth observation was 22 cm and minimum height observed in the fifth observation was 20 cm.

**Height of bokchoy in without mulching:**

The results of the heights of Bokchoy in without mulching are tabulated in Table 4.

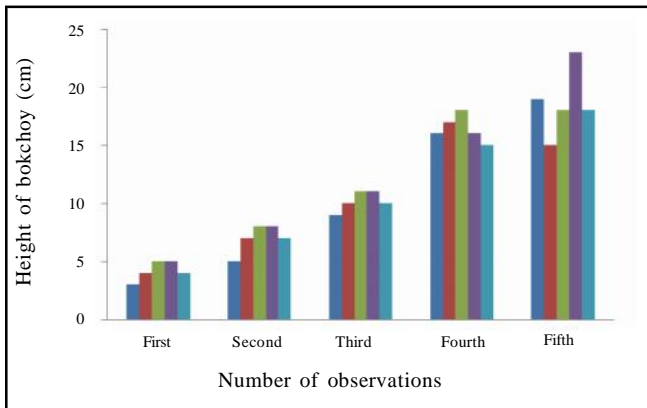
**Height of bokchoy in treatment T<sub>5</sub>:**

In the treatment without mulching with 100 per cent irrigation, height of plants increases day by day which was recorded five times after seven days interval. The maximum height observed in first observation was 5cm and minimum height observed in the first observation was 3 cm. The maximum height observed in second observation was 8 cm and minimum height observed in the second observation was 5 cm. The maximum height observed in third observation was 11 cm and minimum height observed in the third observation was 9 cm. The maximum height observed in fourth observation was 18 cm and minimum height observed in the fourth

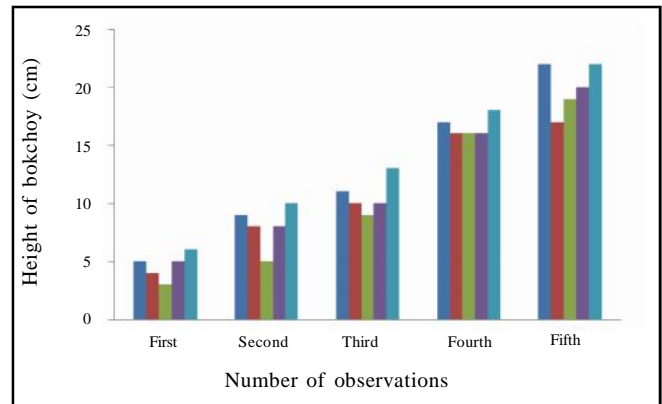
observation was 15 cm. The maximum height observed in fifth observation was 23 cm and minimum height observed in the fifth observation was 15 cm.

**Height of bokchoy in treatment T<sub>6</sub>:**

In the treatment without mulching with 80 per cent irrigation, height of plants increases day by day which is recorded five times after seven days interval. The maximum height observed in first observation was 6 cm and minimum height observed in the first observation was 3 cm. The maximum height observed in second observation was 10 cm and minimum height observed in the second observation was 5 cm. The maximum height observed in third observation was 13 cm and minimum height observed in the third observation was 9 cm. The maximum height observed in fourth observation was 18 cm and minimum height observed in the fourth observation was 16 cm. The maximum height observed in fifth observation was 22 cm and minimum height observed in the fifth observation was 17 cm.



**Fig. 6 : Height of bokchoy in treatment T<sub>5</sub> at different observations**



**Fig. 7 : Height of bokchoy in treatment T<sub>6</sub> at different observations**

**Table 5 : Number of leaves of bokchoy with plastic mulching**

Plant No.	1 <sup>st</sup> time		2 <sup>nd</sup> time		3 <sup>rd</sup> time		4 <sup>th</sup> time		5 <sup>th</sup> time	
	T <sub>1</sub>	T <sub>2</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>1</sub>	T <sub>2</sub>
3 <sup>rd</sup>	6	4	6	6	9	9	11	11	13	13
6 <sup>th</sup>	8	4	9	5	12	8	12	10	14	13
16 <sup>th</sup>	5	5	6	7	9	10	11	10	13	13
24 <sup>th</sup>	6	4	6	6	8	9	11	12	13	14
29 <sup>th</sup>	5	4	6	6	8	9	10	12	12	14
F cal.					14.8573					
S.E.±					0.5499					
C.D. (P=0.05)					1.1472					

**Number of leaves of bokchoy:**

Number of leaves of bokchoy per row was measured at 7 days interval during the whole base period. Five plants per treatment were selected for observations. The position of plants in each treatment was taken as same. The results of the number of leaves obtained are tabulated in the given tables.

**Number of leaves of bokchoy with plastic mulching:**

The results of the number of leaves of bokchoy with plastic mulching are tabulated in Table 5.

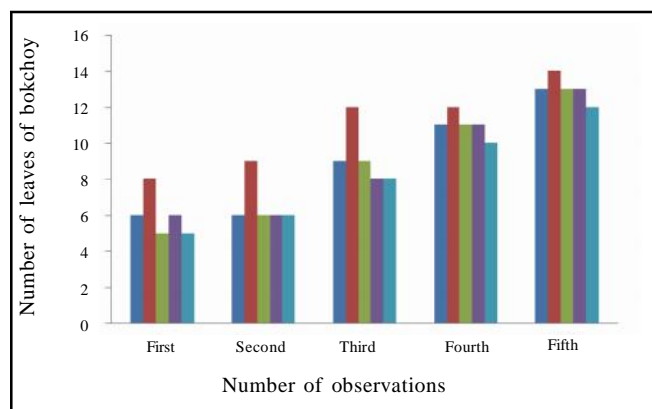
**Number of leaves of bokchoy in treatment T<sub>1</sub>:**

In the treatment plastic mulching with 100 per cent irrigation, maximum number of leaves observed in the first observation was 8 and the minimum number of leaves was 5. The maximum number of leaves observed in the second observation was 9 and the minimum number of leaves was 6. The maximum number of leaves observed in the third observation was 12 and the minimum

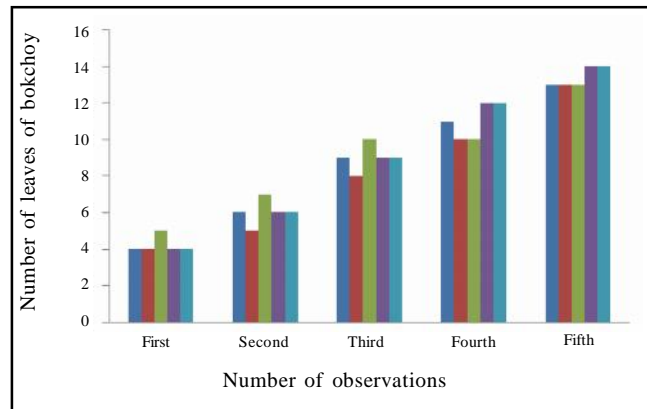
number of leaves was 8. The maximum number of leaves observed in the fourth observation was 12 and the minimum number of leaves was 10. The maximum number of leaves observed in the fifth observation was 14 and the minimum number of leaves was 12.

**Number of leaves of bokchoy in treatment T<sub>2</sub>:**

In the plastic mulching with 80 per cent irrigation treatment, maximum number of leaves observed in the first observation was 5 and the minimum number of leaves was 4. The maximum number of leaves observed in the second observation was 7 and the minimum number of leaves was 5. The maximum number of leaves observed in the third observation was 10 and the minimum number of leaves was 8. The maximum number of leaves observed in the fourth observation was 12 and the minimum number of leaves was 10. The maximum number of leaves observed in the fifth observation was 14 and the minimum number of leaves was 13.



**Fig. 8 :** Number of leaves in treatment T<sub>1</sub> at different observations



**Fig. 9 :** Number of leaves in treatment T<sub>2</sub> at different observations

Plant No.	1 <sup>st</sup> time		2 <sup>nd</sup> time		3 <sup>rd</sup> time		4 <sup>th</sup> time		5 <sup>th</sup> time	
	T <sub>3</sub> (cm)	T <sub>4</sub> (cm)	T <sub>3</sub> (cm)	T <sub>4</sub> (cm)	T <sub>3</sub> (cm)	T <sub>4</sub> (cm)	T <sub>3</sub> (cm)	T <sub>4</sub> (cm)	T <sub>3</sub> (cm)	T <sub>4</sub> (cm)
3 <sup>rd</sup>	4	5	5	6	9	8	10	9	14	11
6 <sup>th</sup>	4	4	5	6	9	8	10	10	13	13
16 <sup>th</sup>	3	5	4	5	7	7	9	9	14	12
24 <sup>th</sup>	6	4	8	5	8	8	9	10	13	14
29 <sup>th</sup>	4	5	4	6	7	7	9	8	12	12
F cal.					14.8573					
S.E.±					0.5499					
C.D. (P=0.05)					1.1472					

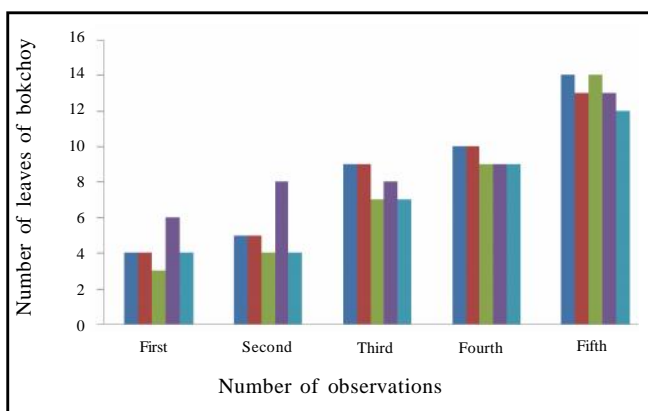


**Number of leaves of bokchoy with organic mulching:**

The results of the number of leaves of bokchoy with organic mulching are tabulated in Table 6.

**Number of leaves of bokchoy in treatment T<sub>3</sub>:**

In the treatment organic mulching with 100 per cent irrigation, maximum number of leaves observed in the first observation was 6 and the minimum number of leaves was 3. The maximum number of leaves observed in the second observation was 8 and the minimum number of leaves was 4. The maximum number of leaves observed in the third observation was 9 and the minimum number of leaves was 7. The maximum number of leaves observed in the fourth observation was 10 and the minimum number of leaves were 9. The maximum number of leaves observed in the fifth observation was 14 and the minimum number of leaves was 12.

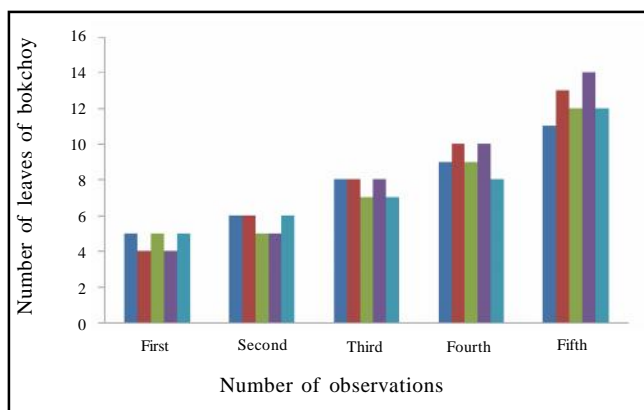


**Fig. 10 : Number of leaves in treatment T<sub>3</sub> at different observations**

**Number of leaves of bokchoy in treatment T<sub>4</sub>:**

In the organic mulching with 80 per cent irrigation

treatment, maximum number of leaves observed in the first observation was 5 and the minimum number of leaves was 4. The maximum number of leaves observed in the second observation was 6 and the minimum number of leaves was 5. The maximum number of leaves observed in the third observation was 8 and the minimum number of leaves was 7. The maximum number of leaves observed in the fourth observation was 10 and the minimum number of leaves was 8. The maximum number of leaves observed in the fifth observation was 14 and the minimum number of leaves was 11.



**Fig. 11 : Number of leaves in treatment T<sub>4</sub> at different observations**

**Number of leaves of bokchoy in without mulching:**

The results of the number of leaves of bokchoy in without mulching are tabulated in Table 7.

**Number of leaves of bokchoy in treatment T<sub>5</sub>:**

In the without mulching with 100 per cent irrigation treatment, maximum number of leaves observed in the first observation was 6 and the minimum number of

Plant No.	1 <sup>st</sup> time		2 <sup>nd</sup> time		3 <sup>rd</sup> time		4 <sup>th</sup> time		5 <sup>th</sup> time	
	T <sub>5</sub>	T <sub>6</sub>	T <sub>5</sub>	T <sub>6</sub>	T <sub>5</sub>	T <sub>6</sub>	T <sub>5</sub>	T <sub>6</sub>	T <sub>5</sub>	T <sub>6</sub>
3 <sup>rd</sup>	5	6	6	7	9	9	9	10	16	13
6 <sup>th</sup>	4	6	5	7	8	7	9	8	14	10
16 <sup>th</sup>	3	3	4	4	9	7	9	9	15	12
24 <sup>th</sup>	5	5	6	6	8	8	9	8	16	11
29 <sup>th</sup>	6	4	7	6	10	8	10	8	13	11
F cal.					14.8573					
S.E. ±					0.5499					
C.D. (P=0.05)					1.1472					



leaves was 3. The maximum number of leaves observed in the second observation was 7 and the minimum number of leaves was 4. The maximum number of leaves observed in the third observation was 10 and the minimum number of leaves were 8. The maximum number of leaves observed in the fourth observation was 10 and the minimum number of leaves was 9. The maximum number of leaves observed in the fifth observation was 16 and the minimum number of leaves was 13.

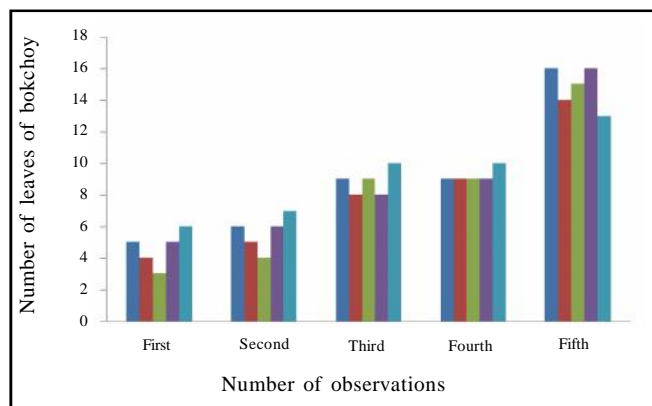


Fig. 12 : Number of leaves in treatment T<sub>5</sub> at different observations

**Number of leaves of bokchoy in treatment:**

In the without mulching with 80 per cent irrigation treatment, maximum number of leaves observed in the first observation was 6 and the minimum number of leaves was 3. The maximum number of leaves observed in the second observation was 7 and the minimum number of leaves was 4. The maximum number of leaves observed in the third observation was 9 and the minimum

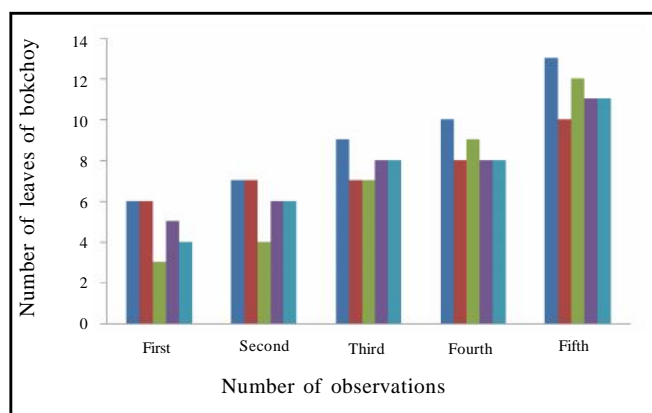


Fig. 13 : Number of leaves in treatment T<sub>6</sub> at different observations

number of leaves was 7. The maximum number of leaves observed in the fourth observation was 10 and the minimum number of leaves was 10. The maximum number of leaves observed in the fifth observation was 13 and the minimum number of leaves was 10.

**Conclusion:**

The field experiment on effect of different mulching and irrigation scheduling on bokchoy was conducted at Mhasrul farm of K. K.Wagh College of Agricultural Engineering and Technology, Nashik during 22<sup>nd</sup> Feb. 2018 to 23<sup>rd</sup> March 2018.

The treatment drip irrigation with plastic mulch and 100 per cent irrigation is the most significant for bokchoy while drip irrigation without mulch and 80 per cent irrigation is the least significant.

The specific results obtained are summarized below:

- In the experiment, the average maximum yield was obtained from plastic mulch with 100 per cent irrigation treatment (192 g) followed by plastic mulch with 80 per cent irrigation treatment (154 g), organic mulch with 100 per cent irrigation treatment (114 g), organic mulch with 80 per cent irrigation treatment (96 g), without mulch with 100 per cent irrigation treatment (94 g), without mulch with 80 per cent irrigation treatment (70 g).

- Average maximum height measured was from plastic mulch treatment with 100 per cent irrigation (15.52 cm) followed by, plastic mulch with 80 per cent irrigation treatment (13.48 cm), organic mulch with 80 per cent irrigation treatment (12.68 cm), organic mulch with 100 per cent irrigation treatment (12.2 cm), without mulching with 80 per cent irrigation treatment (11.96 cm) and without mulching with 100 per cent irrigation treatment (11.28 cm).

- Average maximum number of leaves (11) were observed in plastic mulch treatment with 100 per cent irrigation treatment followed by, plastic mulch with 80 per cent irrigation treatment (10), without mulch with 100 per cent irrigation treatment (9), organic mulch with 100 per cent irrigation treatment (8), organic mulch with 80 per cent irrigation treatment (8) and without mulch with 80 per cent irrigation treatment (7).

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