

PERFORMANCE OF IBA AND NAA CONCENTRATIONS FOR SHOOTS IN FIG (*Ficus carica* L.) CV. DINKAR

ABSTRACT

The experiment on performance of IBA and NAA concentrations for shoots in Fig (*Ficus carica* L.) cv. Dinkar. was carried out at Central Nursery, Vasant Rao Naik Marathwada Krishi Vidyapeeth Parbhani during *kharif* season in year 2018-19. The objective was to find out suitable concentration of growth regulators for Shoots and success of air layer. The experiment was laid out in Randomized Block Design in Nine treatments with three replications. The treatments were T₁ (IBA-2500 ppm), T₂ (IBA-5000 ppm), T₃ (IBA-7500 ppm), T₄ (IBA-10000 ppm), T₅ (NAA-2500 ppm), T₆ (NAA-5000 ppm), T₇ (IBA+NAA-2500+ 2500 ppm), T₈ (IBA+NAA-5000+ 5000 ppm) and T₉ (Control).

The treatment T₃ (IBA 7500 ppm) also significantly influenced in regards to shoot growth parameters as it recorded minimum number of days required for first sprouting (10.10), length of shoot (6.67, 13.67 and 18.67 cm), number of leaves (6.22, 7.99 and 9.88), number of sprouts (2.87, 4.77 and 6.66), number of shoots (3.54, 5.44 and 7.33), stem girth (2.13, 3.13 and 4.28 cm), seedling height (14.67, 21.68 and 27.66 cm) at 30, 60 and 90 days after transplanting respectively. The treatment T₃ (IBA 7500 ppm) also recorded the maximum success percentage (96.33%) and benefit cost ratio (1.81) after 90 days of transplanting.

(Key words: Growth parameters, Treatments, Fig, Growth regulators, Percentage)

INTRODUCTION

Fig (*Ficus carica* L.) is a deciduous and subtropical fruit crop. It is said to be originated in the east mediterranean region, from where its cultivation expanded to the whole of the mediterranean region. Fig belongs to Moraceae family. It contains 2n=56 chromosome. Along with date palm, *vinifera* grape and olive, the fig was one of the important fruit crops of the ancient civilization of the eastern mediterranean region and appeared in many songs and legends of historical and mythological background.

Fresh fruit contains 84% pulp and 16% skin. The average composition of fig is 269 calories, 4 gm proteins, 200 mg calcium, 4 mg iron, 100 IU vitamin A and thiamine per 100 gm of edible portion. In fresh fig 11.50% total sugar also found. Fig helps to maintain the

acid alkali-acid balance of the body effectively neutralizing excess acid. The fruit contain 3.02 per cent (dry weight basis) total acid. The acid content range from 0.1 to 0.2 percent (as citric acid). Fresh figs also contain gum mucilage (0.8%) and pentasans (0.83%).

Fig coffee is manufactured in Europe which is used as a substitute for coffee. It is good source of carbohydrates including fibre. Fresh fruit are rich in calorie, protein, calcium, and iron. The fruit contain 3.02 percent (dry weight basis) total acid. Citric acid is the predominant acid in fig. As fig is gaining greater importance and is preferred in dry land horticulture, perpetuation of the crop needs immediate attention. Although, it is possible to propagate this crop from stem cuttings and by air layering, commercially it is propagated through stem cutting. Reports on systematic investigation into various aspect of propagation of fig from stem cutting and air layering is scanty and sporadic. As the soil and climatic conditions are suitable and favourable for cultivation of fig. There is an ever increasing demand for the planting materials in south India. This investigation facilitates easier, quicker and successful method of propagation with easy and profuse rooting of cutting and air layering in fig.

It is also cultivated in small area in Bangalore, Mysore, Chitradurga and Bellary districts of Karnataka as well as Ananthpur district of Andhra Pradesh. The total area under fig cultivation is reported to be 883 ha, with production of 2850 MT. (Anonymus 2017-2018).

MATERIAL AND METHODS

The present investigation entitled “Performance of IBA and NAA concentrations for shoots in Fig (*Ficus carica* L.) cv. Dinkar” was undertaken at Central nursery, College of Agriculture, Vasantarao Naik Marathawada Krishi Vidyapeeth, Parbhani Maharashtra State during the year 2018-19. Field was situated at 19°16′ North latitude and 76°47′ East longitude and at an altitude of 408.50 m above the mean sea level (MSL) and has subtropical climate.

The experiment required plant growth regulator i.e IBA, NAA for early rooting for early root initiation, sphagnum moss as a rooting media. For wrapping of air layers polythene paper pieces of 200 µ gauge were used and for tying of air layers sutali was used. Poly bags (4" x 5") were used for planting air layers, to study the survival (%) of air layers.

The plants were four years old of uniform size planted at a distance (6m x 6m) to serve as a mother plants for preparing layers. Twenty seven uniform plants were randomly

selected for the experiment. The number of shoots treated in each treatment in one replication was 30. The total number of shoots treated in each treatment in all replications was 810. Ten extra layers were treated in each treatment from which, data regarding inducement of root rate of periodical increase in formation and to record root and shoot growth parameters. Transparent polythene (200 gauge) was used as wrapper. The size of the polythene wrapper was 4x5 cm.

Table 1 .Treatment detail:

Sr. No.	TREATMENTS
T ₁	IBA- 2500 ppm
T ₂	IBA-5000 ppm
T ₃	IBA -7500 ppm
T ₄	IBA- 10000 ppm
T ₅	NAA – 2500 ppm
T ₆	NAA- 5000 ppm
T ₇	IBA (2500 ppm)+NAA(2500 ppm)
T ₈	IBA (5000 ppm)+NAA (5000 ppm)
T ₉	Control

Length of shoot (cm)

Length of shoot or plant height was measured in cm. after 30, 60, 90 days of transplanting with the help of meter scale in each treatment.

Days for First sprouting

Days required for first sprout was counted by observation of transplanted air layers in nursery at days required after transplanting. The number of days taken for emergence of first sprout of air layers in each treatment was calculated for tagged air layers.

Number of leaves

The number of leaves per air layers was counted after 30, 60 and 90 days of layer transplanting in each treatment.

Number of sprouts

The number of shoots per air layers was counted after 30, 60 and 90 days of layering in each treatment.

Number of shoot

After 30, 60, 90 days of layer transplanting in nursery with well labelled tag, the number of branches was counted in each treatment.

Stem girth (cm)

The stem girth was measured in mm. with the help of vernier caliper. These observations were recorded after 30, 60 and 90 days of transplanting.

Seedling height (cm)

Measurement of the Plant height in each treatment was done by ruler at 30, 60 and 90 days after transplanting.

Success percentage (%)

After detaching the layers from mother plant, the layers were defoliated retaining the petioles intact and carefully transplanted into polythene bags (25 x 20 cm) with holes (4-6) filled with potting mixture comprising Sand:Soil:Farm Yard Manure in 1: 1:1 ratio by volume. These bagged layers were allowed to grow inside shade net house and watered as and when necessary. After 90 days of transplantation the success percentage was calculated by following formula.

$$\text{Success of air layers (\%)} = \frac{\text{Total no. of survived layered plants}}{\text{Total planted layered plant}} \times 100$$

Results and Discussion

Length of shoot at 30 days after transplanting

At 30 days after transplanting significantly maximum length of shoot (6.67 cm) was observed in treatment T₃ (IBA 7500 ppm) which was found at par with treatment T₇ (IBA 2500 ppm + NAA 2500 ppm) (5.85 cm) followed by treatments T₁ (IBA 2500 ppm) (5.33 cm) and T₆ (NAA 5000 ppm) (4.66 cm) respectively. The treatment T₉ (Control) recorded significantly minimum length of shoot (3.22 cm).

Length of shoot at 60 days after transplanting

At 60 days after significantly transplanting maximum length of shoot (13.67 cm) was observed in treatment T₃ (IBA 7500 ppm) which were found at par with treatments T₇ (IBA 2500 ppm + NAA 2500 ppm) (13.02cm) and T₁ (IBA 2500 ppm) (12.33 cm) followed by

treatments T₆ (NAA 5000 ppm) (11.36 cm) and T₅ (NAA 2500 ppm) (10.92 cm) respectively. The treatment T₉ (Control) recorded significantly minimum length of shoot (9.57 cm).

Length of shoot at 90 days after transplanting

At 90 days after transplanting significantly maximum length of shoot (18.67 cm) was observed in treatment T₃ (IBA 7500 ppm) which was 22.18 per cent increased as compared to control however which were found at par with treatments T₇ (IBA 2500 ppm + NAA 2500 ppm) (17.93cm) which was 19.40 per cent increased as compared to control and T₁ (IBA 2500 ppm) (17.20 cm). It was followed by treatments T₆ (NAA 5000 ppm) (16.35cm) and T₅ (NAA 2500 ppm) (15.80 cm) respectively. The treatment T₉ (Control) recorded significantly minimum length of shoot sprouts (14.53cm).

Table 2 . Effect of different levels of growth regulators on length of sprouted shoot of air layers in fig cv. Dinkar.

Sr. No.	Treatments	Length of shoot (cm)		
		30 DAT	60 DAT	90 DAT
1	T1 – IBA 2500 ppm	5.33	12.33	17.20 (15.52)
2	T2 – IBA 5000 ppm	3.66	10.66	15.64 (7.09)
3	T3 – IBA 7500 ppm	6.67	13.67	18.67 (22.18)
4	T4 – IBA 10000 ppm	3.54	10.44	15.44 (5.90)
5	T5 – NAA 2500 ppm	3.99	10.92	15.80 (8.04)
6	T6 – NAA 5000 ppm	4.66	11.36	16.35 (11.13)
7	T7- IBA+NAA – 2500+2500 ppm	5.85	13.02	17.93 (19.40)
8	T8 – IBA+NAA – 5000+5000 ppm	4.22	10.76	15.60 (6.85)
9	T9- Control	3.22	9.57	14.53
	SE±	0.32	0.57	0.61
	CD at 5% level	0.97	1.73	1.83

These result are in conformity with those reported by Maurya *et al.* (2012) in guava, Munde *et al.* (2016), Ramkete *et al.* (2016) in pomegranate, Patel *et al.* (2017) in fig.

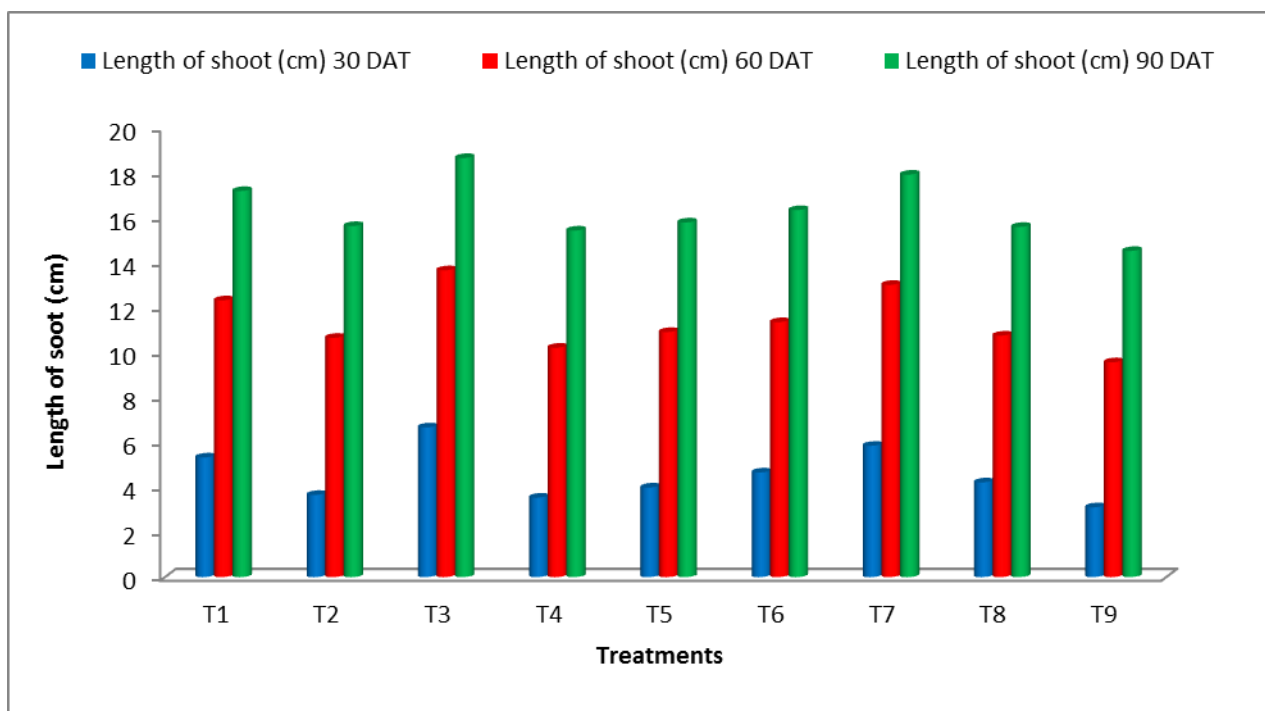


Fig. 1 Effect of different growth regulators on air layering in fig on length of shoot (cm)

Table 3. Effect of different different levels of growth regulators on days required for shoot sprouting in air layering in fig cv. Dinkar.

Sr. No.	Treatments	Days to first sprouting
1	T1 – IBA 2500 ppm	11.86 (- 16.11)
2	T2 – IBA 5000 ppm	12.11 (- 13.71)
3	T3 – IBA 7500 ppm	10.10 (-36.34)
4	T4 – IBA 10000 ppm	11.55 (-19.23)
5	T5 – NAA 2500 ppm	11.44 (- 20.37)
6	T6 – NAA 5000 ppm	11.99 (- 14.85)
7	T7- IBA+NAA – 2500+2500 ppm	10.88 (-26.57)
8	T8 – IBA+NAA – 5000+5000 ppm	11.88 (-15.91)
9	T9- Control	13.77
	SE±	0.53
	CD at 5% level	1.61

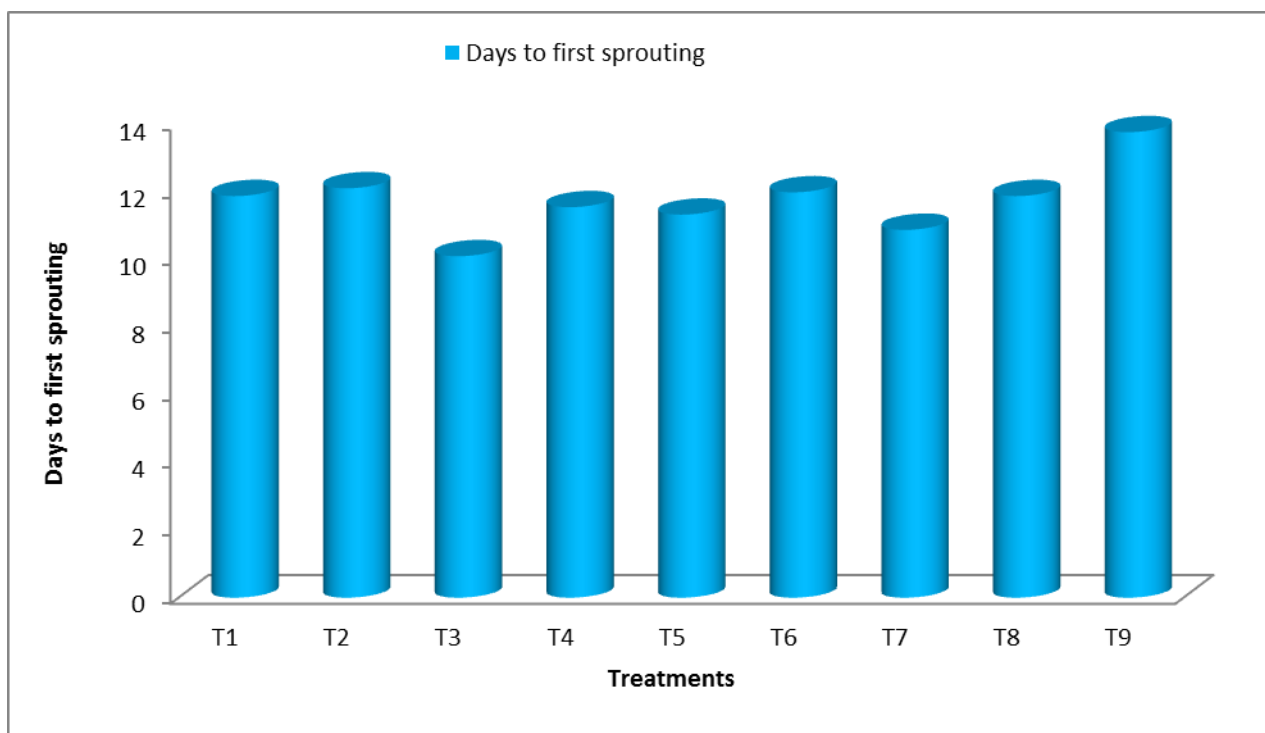


Fig. 2 Effect of different growth regulators on air layering in fig on days to first sprouting

Days required for first sprouting

IBA, NAA and their combination significantly had influenced the first sprout appearance and causing early shoot sprouting of transplanted seedlings. The mean days required for first sprouting of shoot on rooted layer ranged from 10.10 to 13.77 days.

The significantly minimum number of days (10.10) required for first sprouting of air layers was recorded in treatment T₃ (IBA 7500 ppm) which was – 36.34 per cent decreased as compared to control however which were found at par with the treatments T₇ (IBA 2500 ppm + NAA 2500 ppm) (10.88) which was 26.57 per cent increased as compared to control, T₅ (NAA 2500 ppm (11.44) and T₄ (IBA 10000 ppm) (11.55) followed by treatments T₁ (IBA 2500 ppm) (11.86) and T₈ (IBA 5000 ppm + NAA 5000 ppm) (11.88) respectively. The significantly maximum number of days (13.77) for appearance of shoot was recorded in treatment T₉ (Control).

The result in are in conformity with those reported by Ganpati *et al.* (1997) in tamarind, Munde *et al.* (2016) in pomegranate, Ramkete *et al.* (2016) in guava and Patel *et al.* (2017) in fig.

Number of leaves at 30 days after transplanting

At 30 days after transplanting significantly maximum number of leaves (6.22) was observed in treatment T₃ (IBA 7500 ppm) which was significantly superior over rest of the treatments. It was followed by the treatments T₇ (IBA 2500 ppm + NAA 2500 ppm) (5.22), T₅ NAA 2500 ppm (5.10) and T₂ (IBA 5000 ppm) (4.99) which were statistically at par each other. The treatment T₉ (Control) recorded significantly minimum number of leaves (3.22) per layer.

Number of leaves at 60 days after transplanting

At 60 days after transplanting significantly maximum number of leaves (7.99) was observed in treatment T₃ (IBA 7500 ppm) which was significantly superior over rest of the treatments. It was followed by the treatments T₇ (IBA 2500 ppm + NAA 2500 ppm) (6.99), T₄ (IBA 10000 ppm) (6.66) and T₁ (IBA 2500 ppm) (6.61) which were statistically at par each other. The treatment T₉ (Control) recorded significantly minimum number of leaves (5.10).

Table 4. Effect of different levels of growth regulators on number of leaves per air layer in fig cv. Dinkar.

Sr. No.	Treatments	Number of leaves		
		30 DAT	60 DAT	90 DAT
1	T1 – IBA 2500 ppm	4.66	6.61	8.11 (19.24)
2	T2 – IBA 5000 ppm	4.99	5.88	7.33 (10.65)
3	T3 – IBA 7500 ppm	6.22	7.99	9.88 (33.71)
4	T4 – IBA 10000 ppm	4.88	6.66	8.10 (19.14)
5	T5 – NAA 2500 ppm	5.10	6.55	7.88 (16.88)
6	T6 – NAA 5000 ppm	4.77	6.11	7.55 (13.25)
7	T7- IBA+NAA – 2500+2500 ppm	5.22	6.99	8.88 (26.24)
8	T8 – IBA+NAA – 5000+5000 ppm	4.33	5.77	7.99 (18.03)
9	T9- Control	3.22	5.10	6.55
	SE±	0.32	0.30	0.41
	CD at 5% level	0.97	0.93	1.25

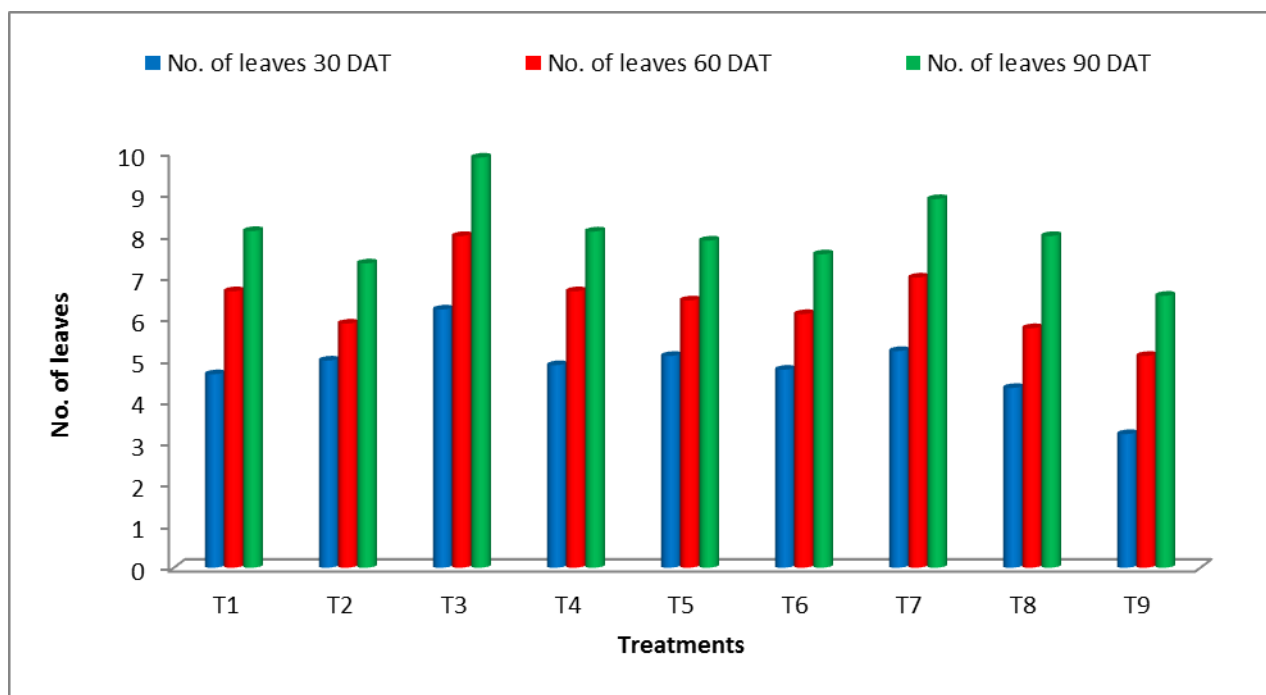


Fig. 3 Effect of different growth regulators on air layering in fig on number of leaves

Number of leaves at 90 days after transplanting

At 90 days after transplanting significantly maximum number of leaves (9.88) was observed in treatment T₃ (IBA 7500 ppm) which was 33.71 per cent increased as compared to control however which was found at par with T₇ (IBA 2500 ppm + NAA 2500 ppm) (8.88) which was 26.24 per cent increased as compared to control. It was followed by treatments T₁ (IBA 2500 ppm) (8.11) and T₄ (IBA 10000 ppm) (8.10) respectively. The treatment T₉ (Control) recorded significantly minimum number of leaves (6.55) per layer.

It might be due to the absorption of more nutrients along with moisture as compare to all other treatments which in turn increase the initiation of more number of leaves.

Number of sprouts at 30 days after transplanting

At 30 days after transplanting significantly maximum number of sprouts (2.87) was observed in treatment T₃ (IBA 7500 ppm) which was found at par with the treatment T₇ (IBA 2500 ppm + NAA 2500 ppm) (2.64) followed by treatments T₆ (NAA 5000 ppm) (2.22) and T₂ (IBA 5000 ppm) (1.88) respectively. The treatment T₉ (Control) recorded significantly minimum number of sprouts (1.00).

Number of sprouts at 60 days after transplanting

At 60 days after transplanting the significantly maximum number of sprout (4.77) was observed in treatment T₃ (IBA 7500 ppm) which were found at par with the treatments T₇ (IBA 2500 ppm + NAA 2500 ppm) (4.55) and T₆ (NAA 5000 ppm) (4.11) followed by treatments T₂ (IBA 5000 ppm) (3.77) and T₅ (NAA 2500 ppm) (3.66) respectively. The significantly minimum numbers of sprouts (2.66) were observed in the treatment T₉ (Control).

Number of sprouts at 90 days after transplanting

At 90 days after transplanting the significantly maximum number of sprouts (6.66) was observed in treatment T₃ (IBA 7500 ppm) which was 35.14 per cent increased as compared to control however which were found at par with the treatments T₇ (IBA 2500 ppm + NAA 2500 ppm) (6.22) which was 30.55 per cent increased as compared to control, T₆ (NAA 5000 ppm) (6.11) and T₅ (NAA 2500 ppm) (5.66) followed by treatments T₂ (IBA 5000 ppm) (5.55) and T₄ (IBA 10000 ppm) (5.44) respectively. The significantly minimum numbers of sprouts (4.32) were observed in the treatment T₉ (Control).

This is probably because of the fact that higher concentration of IBA promoted the cell elongation and cell division which increased number of sprouts. Finding corroborates with their results obtained by Bhardwaj *et al.* (2005) in guava, Patel *et al* (2012) in pomegranate.

Table 5. Effect of different levels of growth regulators on number of sprouts per air layer air layering in fig cv. Dinkar.

Sr. No.	Treatments	No. of sprouts		
		30 DAT	60 DAT	90 DAT
1	T1 – IBA 2500 ppm	1.56	3.44	5.33 (18.95)
2	T2 – IBA 5000 ppm	1.88	3.77	5.55 (22.17)
3	T3 – IBA 7500 ppm	2.87	4.77	6.66 (35.14)
4	T4 – IBA 10000 ppm	1.77	3.55	5.44 (20.59)
5	T5 – NAA 2500 ppm	1.66	3.66	5.66 (23.68)
6	T6 – NAA 5000 ppm	2.22	4.11	6.11 (29.30)
7	T7- IBA+NAA – 2500+2500 ppm	2.64	4.55	6.22 (30.55)
8	T8 – IBA+NAA – 5000+5000 ppm	1.18	3.10	5.11 (15.46)
9	T9- Control	1.00	2.66	4.32
	SE±	0.09	0.27	0.33

	CD at 5% level	0.28	0.83	1.01
--	----------------	------	------	------

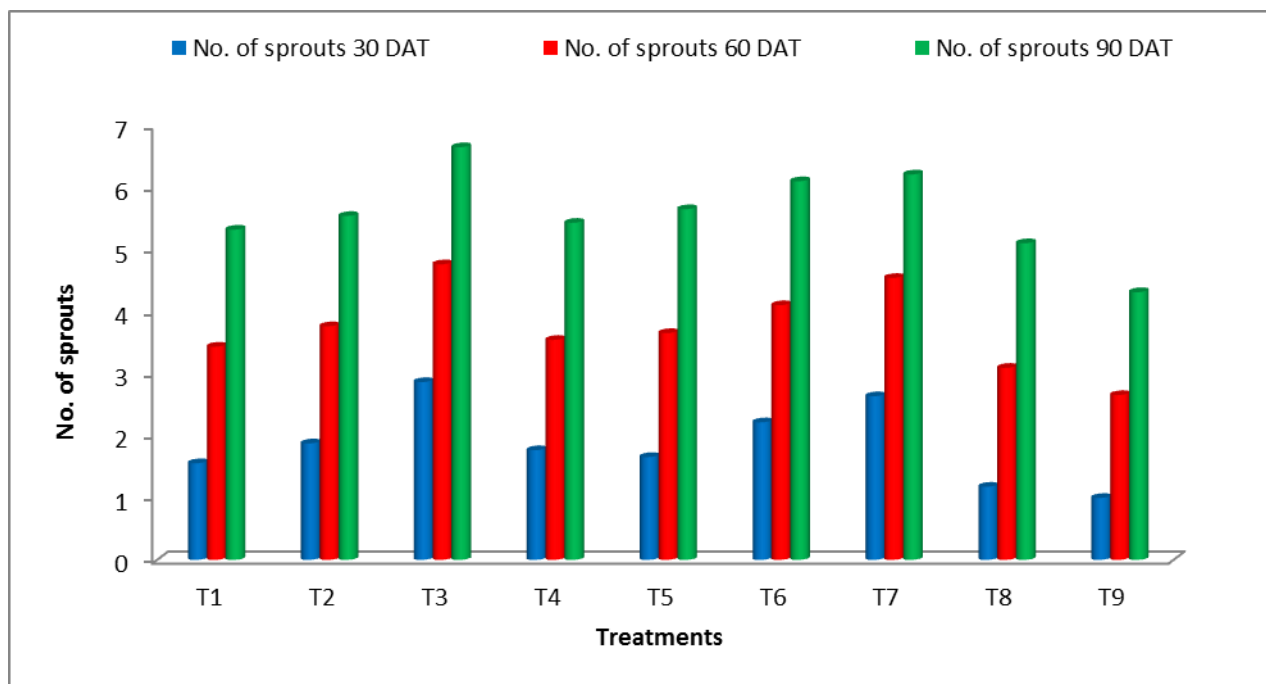


Fig. 4 Effect of different growth regulators on air layering in fig on number of sprouts

Number of shoot at 30 days after transplanting

At 30 days after transplanting significantly maximum number of shoots (3.54) was observed in treatment T₃ (IBA 7500 ppm) which was found at par with treatment T₇ (IBA 2500 ppm + NAA 2500 ppm) (3.17) followed by treatments T₆ (NAA 5000 ppm) (2.88) and T₂ (IBA 5000 ppm) (2.55) respectively. The treatment T₉ (Control) recorded significantly minimum number of shoots (1.66).

Number of shoots at 60 days after transplanting

At 60 days after transplanting significantly maximum number of shoots (5.44) was observed in treatment T₃ (IBA 7500 ppm) which were found at par with treatments T₇ (IBA 2500 ppm + NAA 2500 ppm) (5.22) and T₆ (NAA 5000 ppm) (4.77) followed by treatments T₂ (IBA 5000 ppm) (4.44) and T₅ (NAA 2500 ppm) (4.33) respectively. The treatment T₉ (Control) recorded significantly minimum number of shoots (3.32).

Number of shoots at 90 days after transplanting

At 90 days after transplanting the significantly maximum number of shoots (7.33) was observed in treatment T₃ (IBA 7500 ppm) which was 31.93 per cent increased as compared to

control however which were found at par with treatments T₇ (IBA 2500 ppm + NAA 2500 ppm) (6.88) which was 27.47 per cent increased as compared to control and T₆ NAA 5000 ppm (6.77) followed by treatments T₅ (NAA 2500 ppm) (6.33) and T₂ (IBA 5000 ppm) (6.22) respectively. The significantly minimum numbers of shoots (4.99) were observed in treatment T₉ (Control).

Table 6 . Effect of different levels of growth regulators on number of shoots per air layer air layering in fig cv. Dinkar.

Sr. No.	Treatments	No. of shoots		
		30 DAT	60 DAT	90 DAT
1	T1 – IBA 2500 ppm	2.23	4.10	5.99 (16.70)
2	T2 – IBA 5000 ppm	2.55	4.44	6.22 (19.78)
3	T3 – IBA 7500 ppm	3.54	5.44	7.33 (31.93)
4	T4 – IBA 10000 ppm	2.44	4.21	6.11 (18.34)
5	T5 – NAA 2500 ppm	2.33	4.33	6.33 (21.17)
6	T6 – NAA 5000 ppm	2.88	4.77	6.77 (26.30)
7	T7- IBA+NAA – 2500+2500 ppm	3.17	5.22	6.88 (27.47)
8	T8 – IBA+NAA – 5000+5000 ppm	1.85	3.77	5.77 (13.52)
9	T9- Control	1.66	3.32	4.99
	SE±	0.17	0.29	0.32
	CD at 5% level	0.51	0.89	0.98

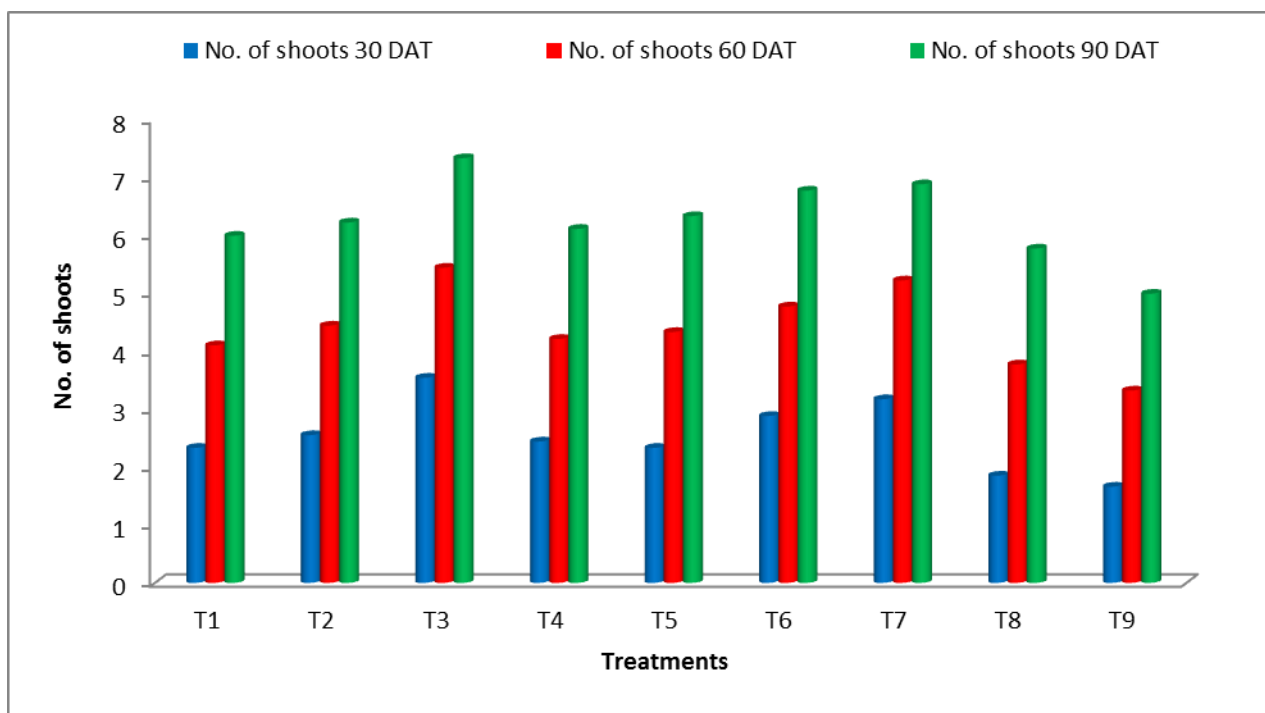


Fig. 5 Effect of different growth regulators on air layering in fig on number of shoots

This is probably because of the fact that higher concentration of IBA promoted the cell elongation and cell division which increased the number of shoots per plant. This result is in conformity with those reported by Bhardwaj *et al.* (2005).

Stem girth at 30 days after transplanting

At 30 days after transplanting significantly maximum stem girth (2.13 cm) was observed in treatment T₃ (IBA 7500 ppm) which was found at par with treatment T₇ (IBA 2500 ppm + NAA 2500 ppm) (1.94 cm) followed by treatments T₁ (IBA 2500 ppm) (1.64 cm) and T₄ (IBA 10000 ppm) (1.65 cm) respectively. The treatment T₉ (Control) recorded significantly minimum stem girth (1.44 cm).

Stem girth at 60 days after transplanting

At 60 days after transplanting significantly maximum stem girth (3.13 cm) was observed in treatment T₃ (IBA 7500 ppm) which was found at par with treatment T₇ (IBA 2500 ppm + NAA 2500 ppm) (2.92 cm) followed by treatments T₄ (IBA 10000 ppm) (2.61 cm) and T₂ (IBA 5000 ppm) (2.56 cm) respectively. The Treatment T₉ (Control) recorded significantly minimum stem girth (2.30 cm).

Stem girth at 90 days after transplanting

At 90 days after transplanting significantly maximum stem girth (4.28 cm) was observed in treatment T₃ (IBA 7500 ppm) which was 35.99 per cent increased as compared to control however which were found at par with treatments T₇ (IBA 2500 ppm + NAA 2500 ppm) (4.07cm) which was 32.68 per cent increased as compared to control, T₁ (IBA 2500 ppm) (3.83 cm), T₂ (IBA 5000 ppm) (3.79 cm), T₅ (NAA 2500 ppm) (5.10) T₄ (IBA 10000 ppm) (3.73 cm) and T₆ (NAA 5000 ppm) (3.67 cm) followed by treatment T₈ (IBA 5000 ppm + NAA 5000 ppm) (3.56 cm) respectively. The treatment T₉ (Control) recorded significantly minimum stem girth (2.74 cm).

This is probably due to higher concentration of IBA promoted the cell elongation and cell division which increased the diameter of plant. Finding corroborates with their results obtained by Bhardwaj *et al.* (2005) in Guava.

Table 7 .Effect of different levels of growth regulators on stem girth air layers in fig cv. Dinkar.

Sr. No.	Treatments	Stem girth (cm)		
		30 DAT	60 DAT	90 DAT
1	T1 – IBA 2500 ppm	1.64	2.41	3.83 (28.46)
2	T2 – IBA 5000 ppm	1.60	2.56	3.79 (27.71)
3	T3 – IBA 7500 ppm	2.13	3.13	4.28 (35.99)
4	T4 – IBA 10000 ppm	1.65	2.61	3.73 (26.55)
5	T5 – NAA 2500 ppm	1.50	2.50	3.71 (26.15)
6	T6 – NAA 5000 ppm	1.57	2.49	3.67 (25.35)
7	T7- IBA+NAA – 2500+2500 ppm	1.94	2.92	4.07 (32.68)
8	T8 – IBA+NAA – 5000+5000 ppm	1.54	2.45	3.56 (23.04)
9	T9- Control	1.44	2.30	2.74
	SE±	0.13	0.11	0.21
	CD at 5% level	0.40	0.35	0.63

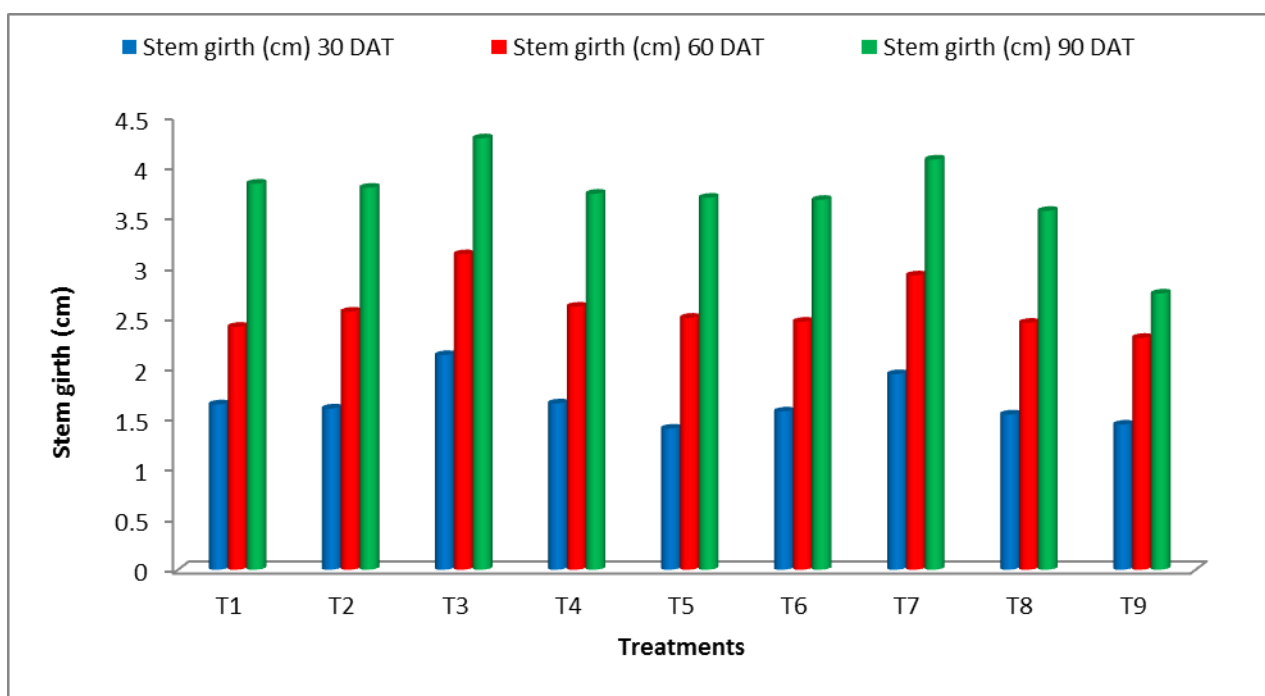


Fig. 6 Effect of different growth regulators on air layering in fig on stem girth (cm)

Seedling height at 30 days after transplanting

At 30 days after transplanting significantly maximum seedling height (14.67 cm) was observed in treatment T₃ (IBA 7500 ppm) which were found at par with the treatments T₇ (IBA 2500 ppm + NAA 2500 ppm) (13.83 cm), T₁ (IBA 2500 ppm) (13.33 cm) and T₆ (NAA 5000 ppm) (12.63 cm) followed by treatments T₈ (IBA 5000 ppm + NAA 5000 ppm) (12.22 cm) and T₅ (NAA 2500 ppm) (11.97 cm) respectively. The treatment T₉ (Control) recorded significantly minimum seedling height (11.22cm).

Seedling height at 60 days after transplanting

At 60 days after transplanting significantly maximum seedling height (21.68cm) was observed in treatment T₃ (IBA 7500 ppm) which were found at par with the treatments T₇ (IBA 2500 ppm + NAA 2500 ppm) (20.83 cm), T₁ (IBA 2500 ppm) (20.16cm) and T₈ (IBA 5000 ppm + NAA 5000 ppm) (19.88 cm) followed by treatments T₆ (NAA 5000 ppm) (19.33 cm) and T₅ (NAA 2500 ppm) (18.95 cm) respectively. The treatment T₉ (Control) recorded significantly minimum seedling height (17.54 cm).

Seedling height at 90 days after transplanting

At 90 days after transplanting significantly maximum seedling height (27.66 cm) was observed in treatment T₃ (IBA 7500 ppm) which was 12.44 per cent increased as compared to control however which were found at par with the treatments T₇ (IBA 2500 ppm + NAA 2500 ppm) (26.81 cm) which was 9.67 per cent increased as compared to control and T₁ (IBA 2500 ppm) (26.16 cm)) followed by treatments T₆ (NAA 5000 ppm) (25.62 cm) and T₈ (IBA 5000 ppm + NAA 5000 ppm) (25.22 cm) respectively. The treatment T₉ (Control) recorded significantly minimum seedling height (24.22 cm).

Table 8. Effect of different levels of growth regulators on seedling height at air layers in fig cv. Dinkar.

Sr. No.	Treatments	Seedling height (cm)		
		30 DAS	60 DAS	90 DAS
1	T1 – IBA 2500 ppm	13.33	20.16	26.16 (7.42)
2	T2 – IBA 5000 ppm	11.66	18.65	24.65 (1.75)
3	T3 – IBA 7500 ppm	14.67	21.68	27.66 (12.44)
4	T4 – IBA 10000 ppm	11.54	18.44	24.55 (1.35)
5	T5 – NAA 2500 ppm	11.97	18.95	24.96 (2.97)
6	T6 – NAA 5000 ppm	12.63	19.33	25.62 (5.46)
7	T7- IBA+NAA – 2500+2500 ppm	13.83	20.83	26.81 (9.67)
8	T8 – IBA+NAA – 5000+5000 ppm	12.22	19.88	25.22 (3.97)
9	T9- Control	11.22	17.54	24.22
	SE±	0.71	0.77	0.71
	CD at 5% level	2.15	2.32	2.14

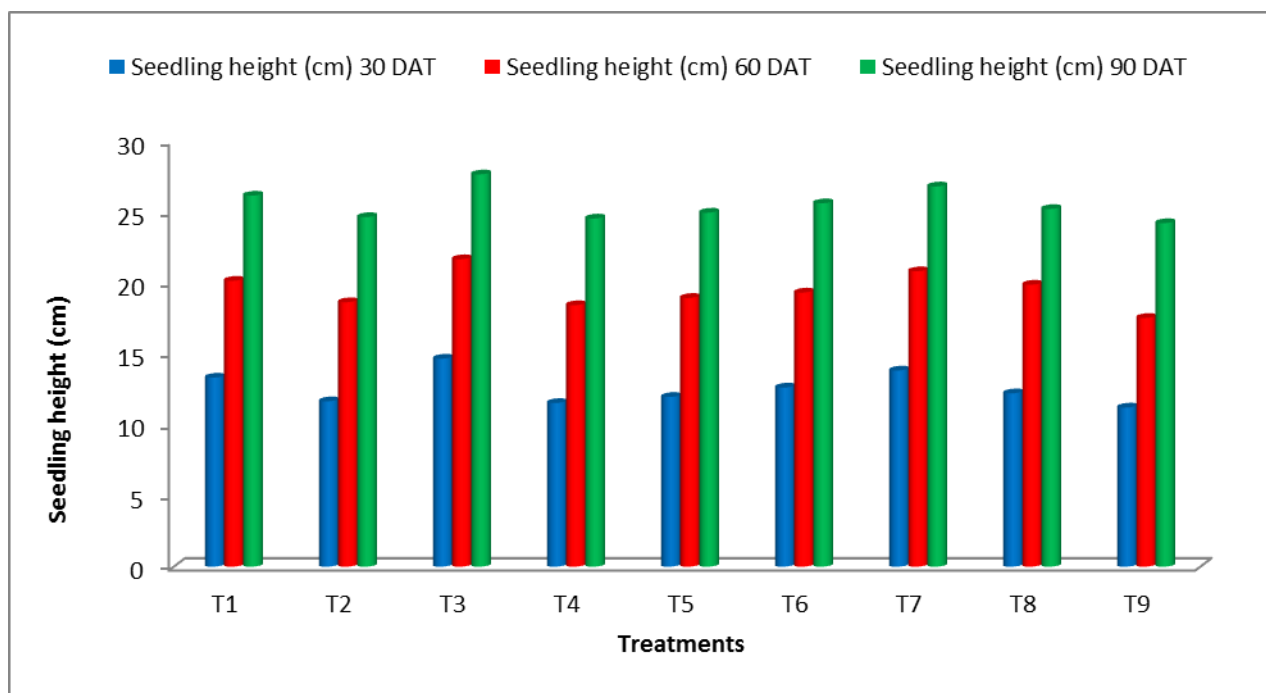


Fig.7 Effect of different growth regulators on air layering in fig on seedling height (cm)

This is probably because of the fact that higher concentration of IBA promoted the cell elongation and cell division which increased the height of plant. These findings are in agreement with the findings of Tomar (2011) in pomogranate, Khapare *et al.* (2012) in fig, Singh *et al.* (2012) in barbados cherry.

Success percentage (%)

The success obtained in the nursery condition in regard of success of air layers with various treatments has been converted in to percentage

Table 9 .Effect of different growth regulators on per cent success of air layers in fig cv. Dinkar.

Sr. No.	Treatments	Success percentage (%)
1	T1 – IBA 2500 ppm	85.16 (9.31)
2	T2 – IBA 5000 ppm	82.64 (6.54)
3	T3 – IBA 7500 ppm	96.33 (19.82)
4	T4 – IBA 10000 ppm	81.98 (5.84)
5	T5 – NAA 2500 ppm	80.25 (3.76)
6	T6 – NAA 5000 ppm	79.74 (3.14)

7	T7- IBA+NAA – 2500+2500 ppm	92.46 (16.47)
8	T8 – IBA+NAA – 5000+5000 ppm	81.11 (4.78)
9	T9- Control	77.24
	SE±	3.41
	CD at 5% level	10.28

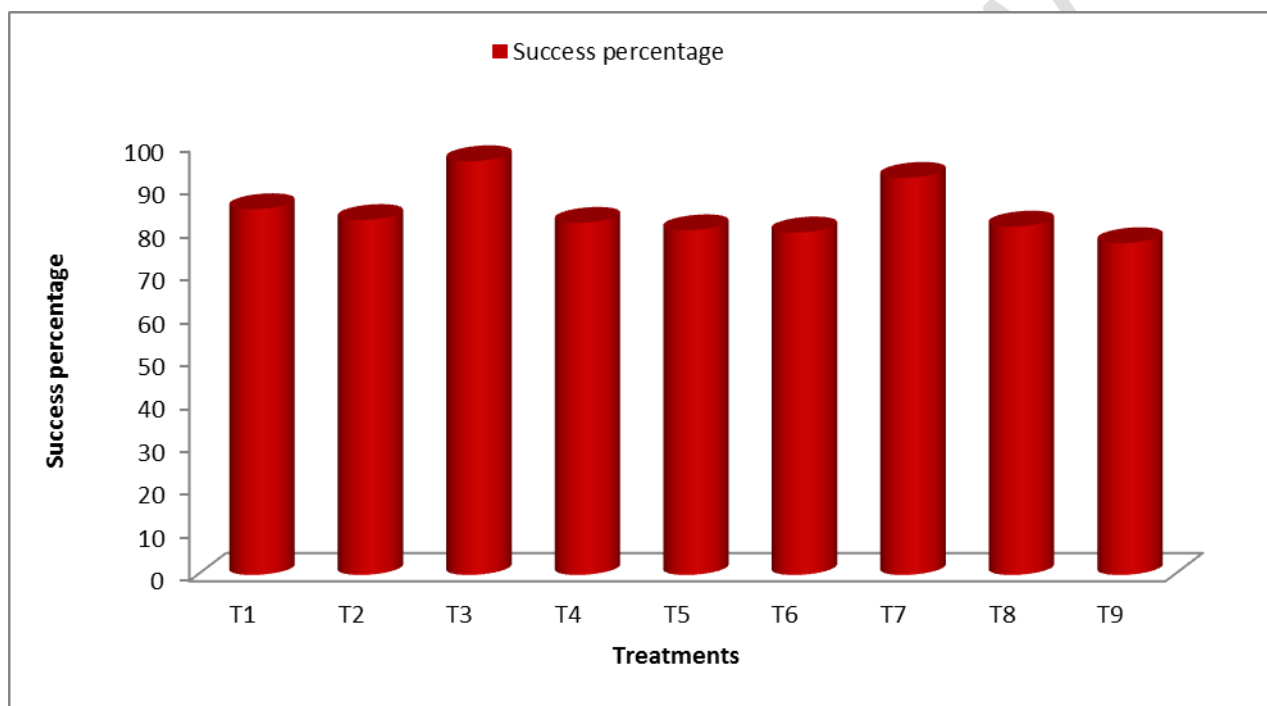


Fig. 8 Effect of different growth regulators on air layering in fig on success Percent (%)

The significantly maximum success per cent (96.33%) was observed in treatment T₃ (IBA 7500 ppm) which was 19.82 per cent increased as compared to control however which was found at par with the treatment T₇ (IBA 2500 ppm + NAA 2500 ppm) (92.46%) which was 16.47 per cent increased as compared to control. It was followed by treatments T₁ (IBA 2500 ppm) (85.16%), T₂ (IBA 5000 ppm) (82.64%) respectively. Treatment T₉ (Control) recorded significantly minimum success per cent (77.24%).

It might be due to better water holding capacity of sphagnum moss as well as more number of root better root length, number of leaves etc. This combination have better absorption of nutrients and moisture from the growing media as well as created more favourable environment for root and shoot growth resulting in higher survival percentage of air layering in fig.

These findings are in agreement with the findings of Ganpati *et al.* (1997) in tamarind, Kumar and Syamal (2005) and Maurya *et al.* (2012) in guava.

Benefit cost ratio

The benefit cost ratio obtained in the nursery condition in regard of air layers with various treatments recorded after transplanting of layers

Table 10 . Effect of different growth regulators on B:C ratio of air layers in fig cv. Dinkar.

Sr. No.	Treatments	B:C ratio
1	T1 – IBA 2500 ppm	1.61 (19.88)
2	T2 – IBA 5000 ppm	1.49 (13.43)
3	T3 – IBA 7500 ppm	1.81 (28.73)
4	T4 – IBA 10000 ppm	1.46 (11.65)
5	T5 – NAA 2500 ppm	1.52 (15.14)
6	T6 – NAA 5000 ppm	1.42 (9.16)
7	T7- IBA+NAA – 2500+2500 ppm	1.79 (27.66)
8	T8 – IBA+NAA – 5000+5000 ppm	1.45 (11.04)
9	T9- Control	1.29
	SE $\pm$	0.06
	CD at 5% level	0.20

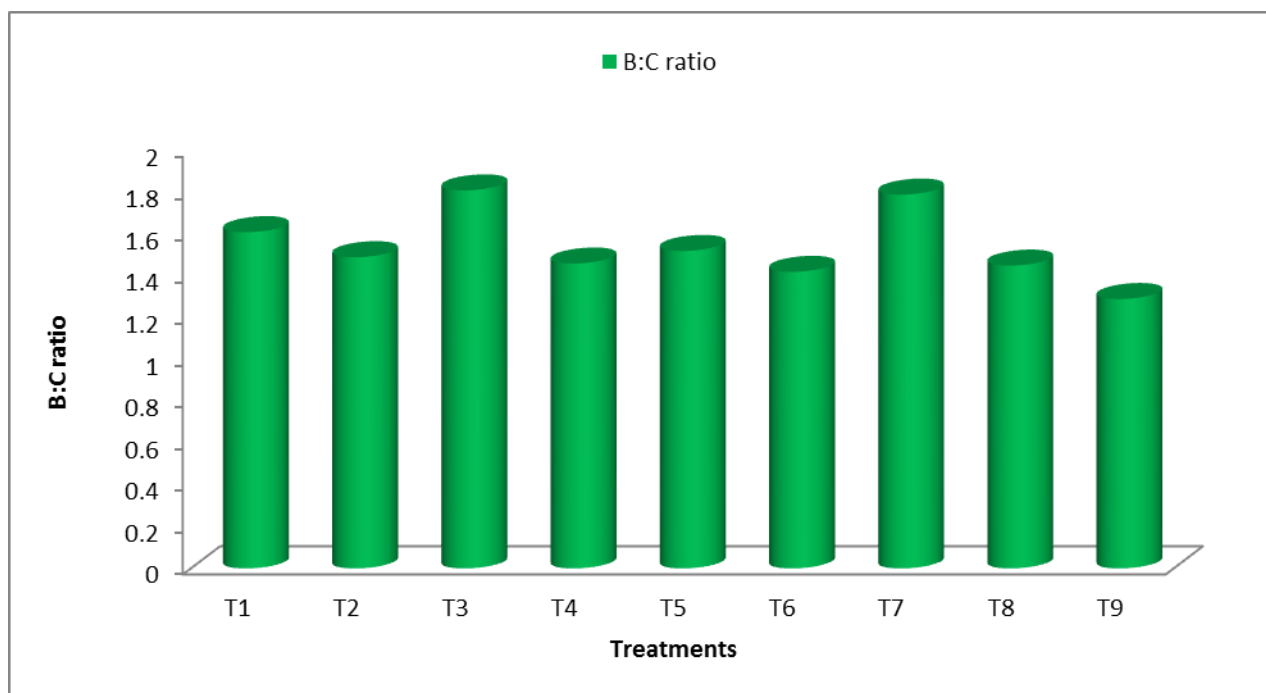


Fig. 9 Effect of different growth regulators on air layering in fig on B:C ratio

The significantly maximum benefit cost ratio (1.81) was observed in treatment T₃ (IBA 7500 ppm) which was 28.73 per cent increased as compared to control however which were found at par with the treatments T₇ (IBA 2500 ppm + NAA 2500 ppm) (1.79) which was 27.94 per cent increased as compared to control and T₁ (IBA 2500 ppm) (1.61) followed by treatments T₅ (NAA 2500 ppm) (1.52) and T₂ (IBA 5000 ppm) (1.49) respectively. Treatment T₉ (Control) recorded significantly minimum benefit cost ratio (1.29).

The result in are in conformity with those reported by Maurya *et al.* (2012) in guava, Bhosale *et al.* (2014) in pomegranate and Reddy *et al.* (2014) in fig.

Conclusion

The overall assessment of the results of present investigation on the “Performance of IBA and NAA concentrations for shoots in Fig (*Ficus carica* L.) cv. Dinkar” concluded that, us of IBA 7500 ppm treatment (T₃) for air layering in fig significantly influenced the root parameters like days to root initiation (12.44), root length (5.64 cm), number of roots (17.77), fresh weight of root (3.34 g) dry weight of root (1.11 g) and rooting percentage (91.11%) and shoot parameters like days required for first sprout (10.10), number of sprouts (2.87, 4.77 and 6.66), shoot length (6.67, 13.67 and 18.67 cm) and it also shows best performance in regards to no. of leaves (6.22, 7.99 and 9.88), no of shoots (3.54, 5.44

and 7.33), stem girth (2.13, 3.13 and 4.28 cm), seedling height (14.67, 21.68 and 27.66 cm) at 30, 60 and 90 days after transplanting respectively. The treatment T₃ (IBA 7500 ppm) also recorded the maximum success percentage (96.33%) and benefit cost ratio (1.81) after 90 days of transplanting. It is evident that use of IBA 7500 ppm treatment (T₃) is a best treatment among all treatments which was at par with treatment T₇ (IBA 2500 ppm + NAA 2500 ppm) followed by treatments T₁ (IBA 2500 ppm), T₅ (NAA 2500 ppm) and treatment T₉ (control) recorded significantly minimum value in air layering in fig cv. Dinkar. The significantly maximum rooting as well as success of air layers and more number of healthy air layers was obtained with use of treatment T₃ (IBA 7500 ppm).

Based on present investigation the application of the treatment T₃ (IBA 7500 ppm) may be recommended on adhoc basis for early and faster rooting in air layering of fig under marathwada condition but it needs further confirmation before final recommendation.

REFERENCES

- Anonymous. (2017-2018). Area and production of fig fruit crop at [http://www. Google.com](http://www.Google.com).
- Bhardwaj R. L and R. R. Meena (2005). Role of plant growth regulators in guava (*Psidium guajava* L.) *Agric. Rev.* 26(4): 281-287.
- Bhosale V. P., Jadhav R. G. and Masu M. M. (2009). Response of different medias and PGR's on rooting and survival of air layers in pomegranate (*Punica granatum* L.) Cv. Sindhuri. *The Asian J. of Hort.*,4(2): 494-497.
- Ganpathi T., Samiullah R. and Naik K. R. (1997). Influence of plant growth regulators on rooting and biochemical composition of tamarind (*Tamarindus indica* L.) air layers. *Karnataka J. of Agric. Sci.*, 10(3): (719-722).
- Khapare L. S., Dahale M. H. and Bhusari R. B. (2012) Propagational studies in fig as affected by plant growth regulator. *The asian journal of horticulture Vol.7 Issue 1*.118-120.
- Kumar K. and Syamal M. M. (2005). Effect of etiolation and plant growth substances on rooting and survival of air layers of guava (*Psidium guajava* L.). *Ind. J. Hort.*, 62(3): 290-292.
- Maurya R. K and Ray N. R. (2012). Evaluation of different organic media and water holding materials with IBA on rooting and survival of air layering in guava (*Psidium*

guavajava L.) cv. Alahabad safeda. *Asian journal of horticulture* vol.7 issue 1. 44- 50

Munde G. R. (2016). Effect of IBA and other chemical on air layering in pomegranate cv. Bhagwa. *Bioinfolt* 13 (2A):291-293.

Patel D. M., Nehete D. S., Jadav R. G. and Satodiya B. N. (2012). Effect of PGRS and rooting media air layering of different pomegranate (*Punica granatum* L.) cultivars, *Asian J. Hort.* 7(1): 89-93.

Patel Hiral. R., Patel M. J. and Singh Sumit (2017). Effect of different levels of IBA and NAA on rootig of hardwood and semi hardwood cutting in fig (*Ficus carica* L.) *International Journal of Agricultural Science and Research (IJASR)* ISSN (P): 2250 0057; ISSN (E): 2321-0087 Vol. 7, Issue 4, 519-524.

Paul R. and Ch. Aditi, (2009). IBA and NAA of 1000ppm Induce more improved rooting characters in air-layers of Waterapple (*Syzygium javanica* L.). *Bulg. J. Agric. Sci.*, 15:123-128.

Ramkete V., Baghel,M., and Raut U.A.(2016).Effect of IBA Concentrations and Time of Air-layering in Guava cv. L-49. *Res. J. of Agri. Sci.* 7 (1): 117-120.

Singh Deepak and sanjay singh (2012). Effect of IBA and NAA on propagation of Barbados cherry through layering .*crop Res.* 43 (1,2&3) :120-122.

Tomar K.S. (2011). Effect of different concentrations of growth regulators on rooting and survival percentage of pomegranate air layers. *Prog. Agric*: 431-433.