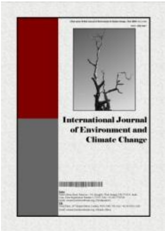

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Performance of IBA and NAA Concentrations for Shoots in Fig (*Ficus carica* L.) Cv. Dinkar

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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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, Vasantrao 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), T_3 (IBA-7500 ppm), T4 (IBA-10000 ppm), T5 (NAA-2500 ppm), T6 (NAA-5000 ppm), T_7 (IBA+NAA-2500+ 2500 ppm), T_8 (IBA+NAA-5000+ 5000 ppm) and T_9 (Control).

The treatment T_3 (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 T_3 (IBA 7500 ppm) also recorded the maximum success percentage (96.33%) and benefit cost ratio (1.81) after 90 days of transplanting.

Keywords: Growth parameters; treatments; fig; growth regulators.

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1. 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 is belongs to Moraceae family. It contain 2n=56 chromosome. Along with date palm, *vinifera* grape and olive, the fig was one of the important fruit crop of the ancient civilization of the eastern mediterranean region and appeared in many songs and legends of historical and mythological background.

Fresh fruit contain of 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 muciliage (0.8%) and pentasons (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 [1].

2. MATERIALS AND METHODS

The present investigation was undertaken at Central nursery, College of Agriculture, Vasantaro Naik Marathawada Krishi Vidyapeeth, Parbhani Maharashtra State during the year 2018-19. Field was situated at $19^{0}16^{\prime}$ North latitude and $76^{0}47^{\prime}$ 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 initition, 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

2.1 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.

2.2 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 emergance of first sprout of air layers in each treatment was calculated for tagged air layers.

2.3 Number of Leaves

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

2.4 Number of Sprouts

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

2.5 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.

2.6 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.

2.7 Seedling Height (cm)

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

2.8 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 neccessary. After 90 days of transplantation the success percentage was calculated by following formula.

Success of air layers (%) = (Total no. of success layer / Total no. of layered plant) X 100

3. RESULTS AND DISCUSSION

3.1 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 T_3 (IBA 7500 ppm) which was found at par with treatment T_7 (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 T_9 (Control) recorded significantly minimum length of shoot (3.22 cm).

3.2 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 T_3 (IBA 7500 ppm) which were found at par with treatments T_7 (IBA 2500 ppm + NAA 2500 ppm) (13.02 cm) 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 T_9 (Control) recorded significantly minimum length of shoot (9.57 cm).

3.3 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 T_3 (IBA 7500 ppm) which was 22.18 per cent increased as compared to control however which were found at par with treatments T_7 (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 T_9 (Control) recorded significantly minimum length of shoot sprouts (14.53 cm).

These result are in conformity with those reported by Maurya et al. [2] in guava, Munde et al. [3], Ramkete et al. [4] in pomegranate, Patel et al. [5] in fig.

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

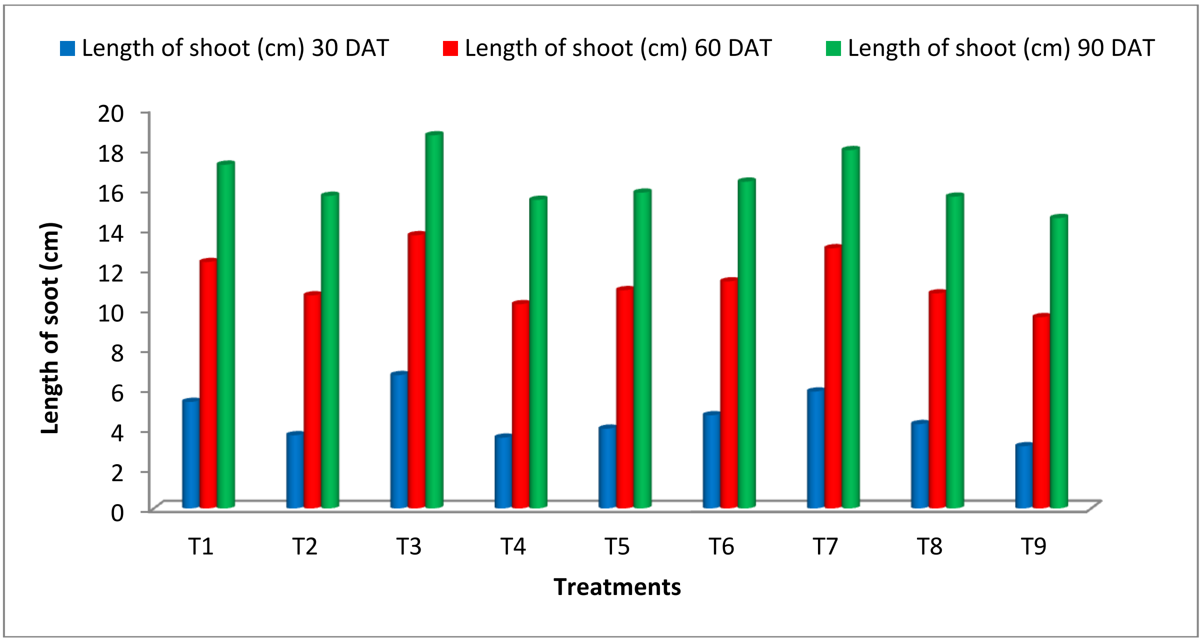

Fig. 1. Effect of different growth regulators on air layering in fig on length of shoot (cm)

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

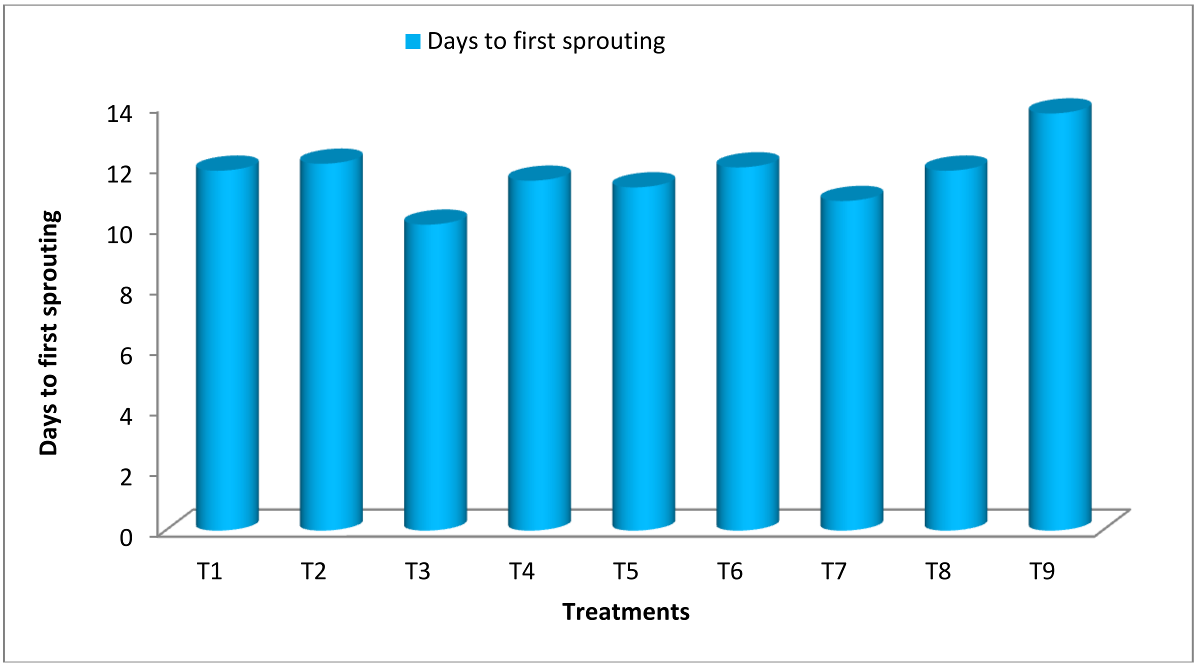

Fig. 2. Effect of different growth regulators on air layering in fig on days to first sprouting

3.4 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 T_3 (IBA 7500 ppm) which was – 36.34 per cent decreased as compared to control however which were found at par with the treatments T_7 (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 T_8 (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 T_9 (Control).

The result in are in conformity with those reported by Ganpati et al. [6] in tamarind, Munde et al. [3] in pomegranate, Ramkete et al*.* [4] in guava and Patel et al*.* [7] in fig.

3.5 Number of Leaves at 30 Days after Transplanting

At 30 days after transplanting significantly maximum number of leaves (6.22) was observed in treatment T_3 (IBA 7500 ppm) which was significantly superior over rest of the treatments. It was followed by the treatments T_7 (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 T_9 (Control) recorded significantly minimum number of leaves (3.22) per layer.

3.6 Number of Leaves at 60 Days after Transplanting

At 60 days after transplanting significantly maximum number of leaves (7.99) was observed in treatment T_3 (IBA 7500 ppm) which was significantly superior over rest of the treatments. It was followed by the treatments T_7 (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 T_9 (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

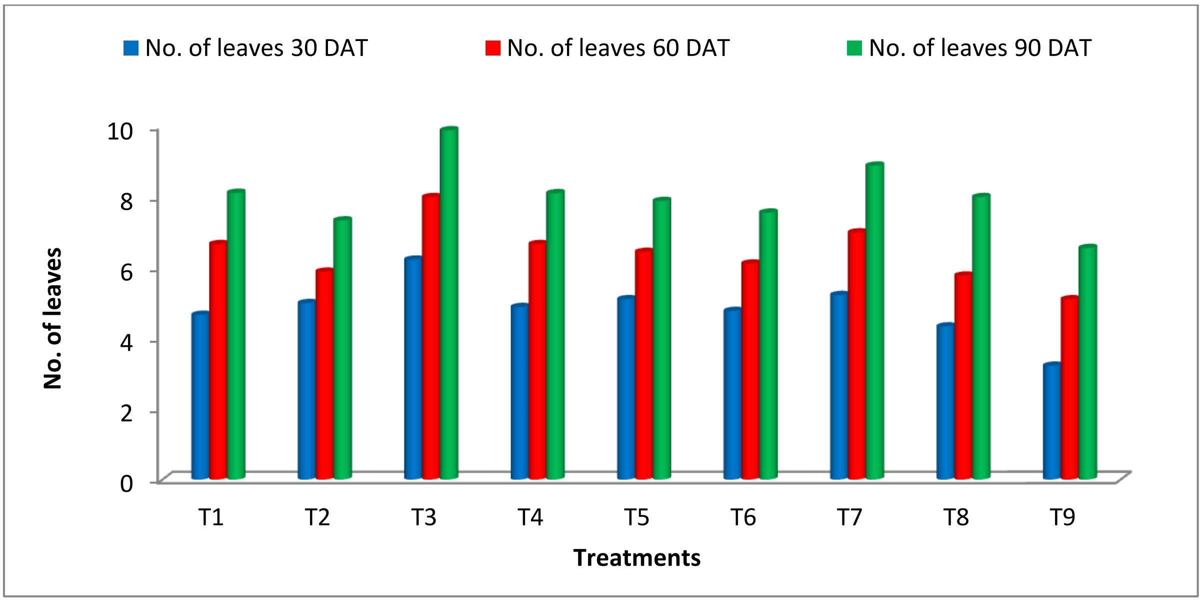

Fig. 3. Effect of different growth regulators on air layering in fig on number of leaves

3.7 Number of Leaves at 90 Days after Transplanting

At 90 days after transplanting significantly maximum number of leaves (9.88) was observed in treatment T_3 (IBA 7500 ppm) which was 33.71 per cent increased as compared to control however which was found at par with T_7 (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 T_9 (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.

3.8 Number of Sprouts at 30 Days after Transplanting

At 30 days after transplanting significantly maximum number of sprouts (2.87) was observed in treatment T_3 (IBA 7500 ppm) which was found at par with the treatment T_7 (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 T_9 (Control) recorded significantly minimum number of sprouts (1.00).

3.9 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 T_3 (IBA 7500 ppm) which were found at par with the treatments T_7 (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 T_9 (Control).

3.10 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 T_3 (IBA 7500 ppm) which was 35.14 per cent increased as compared to control however which were found at par with the treatments T_7 (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 T_5 (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 T_9 (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. [8] in guava, Patel et al. [7] in pomegranate, Paul R. et al. [9] in Waterapple.

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

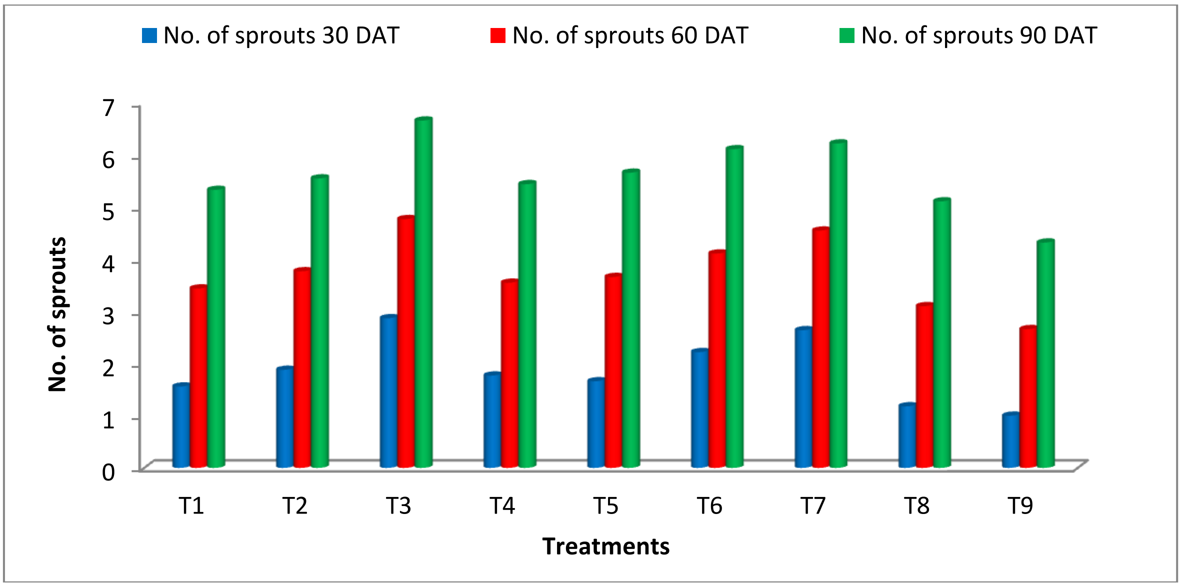

Fig. 4. Effect of different growth regulators on air layering in fig on number of sprouts

3.11 Number of Shoot at 30 Days after Transplanting

At 30 days after transplanting significantly maximum number of shoots (3.54) was observed in treatment T_3 (IBA 7500 ppm) which was found at par with treatment T_7 (IBA 2500 ppm + NAA 2500 ppm) (3.17) followed by treatments T_6 (NAA 5000 ppm) (2.88) and T2 (IBA 5000 ppm) (2.55) respectively. The treatment T_9 (Control) recorded significantly minimum number of shoots (1.66).

3.12 Number of Shoots at 60 Days after Transplanting

At 60 days after transplanting significantly maximum number of shoots (5.44) was observed in treatment T_3 (IBA 7500 ppm) which were found at par with treatments T_7 (IBA 2500 ppm + NAA 2500 ppm) (5.22) and T_6 (NAA 5000 ppm) (4.77) followed by treatments T2 (IBA 5000 ppm) (4.44) and T5 (NAA 2500 ppm) (4.33) respectively. The treatment T_9 (Control) recorded significantly minimum number of shoots (3.32).

3.13 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 T_3 (IBA 7500 ppm) which was 31.93 per cent increased as compared to control however which were found at par with treatments T_7 (IBA 2500 ppm + NAA 2500 ppm) (6.88) which was 27.47 per cent increased as compared to control and T_6 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 T_9 (Control).

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 in are in conformity with those reported by Bhardwaj et al. [8].

3.14 Stem Girth at 30 Days after Transplanting

At 30 days after transplanting significantly maximum stem girth (2.13 cm) was observed in treatment T_3 (IBA 7500 ppm) which was found at par with treatment T_7 (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 T_9 (Control) recorded significantly minimum stem girth (1.44 cm).

3.15 Stem Girth at 60 Days after Transplanting

At 60 days after transplanting significantly maximum stem girth (3.13 cm) was observed in treatment T_3 (IBA 7500 ppm) which was found at par with treatment T_7 (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 T_9 (Control) recorded significantly minimum stem girth (2.30 cm).

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

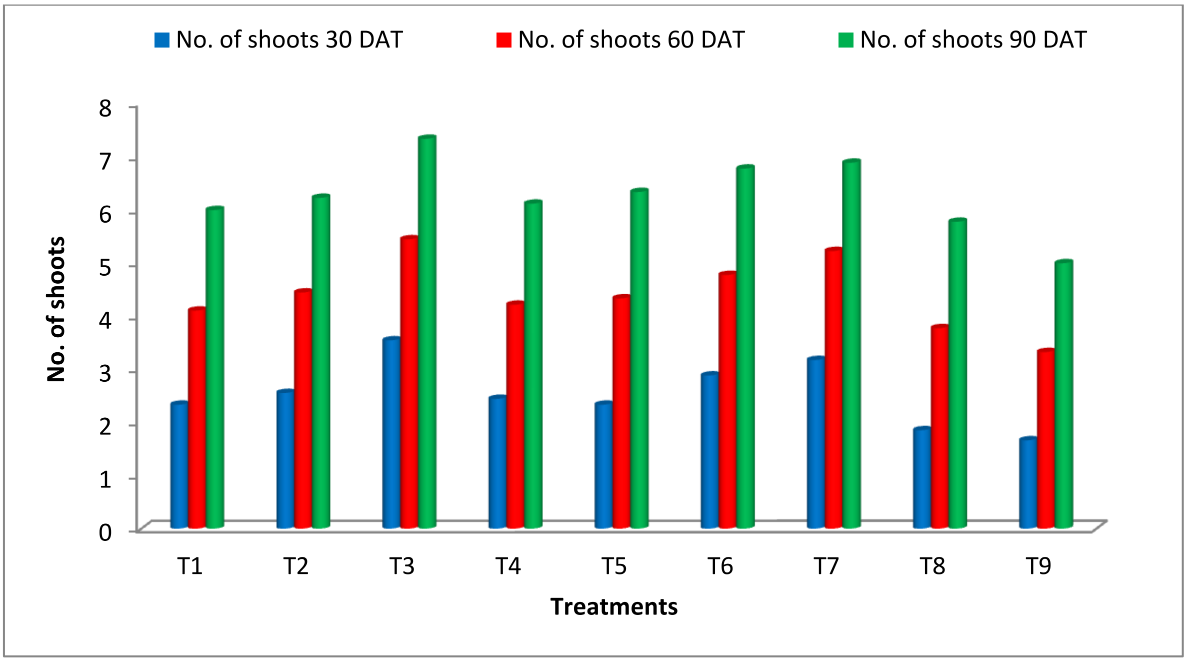

Fig. 5. Effect of different growth regulators on air layering in fig on number of shoots

3.16 Stem Girth at 90 Days after Transplanting

At 90 days after transplanting significantly maximum stem girth (4.28 cm) was observed in treatment T_3 (IBA 7500 ppm) which was 35.99 per cent increased as compared to control however which were found at par with treatments T_7 (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 T_6 (NAA 5000 ppm) (3.67 cm) fallowed by treatment T_8 (IBA 5000 ppm + NAA 5000 ppm) (3.56 cm) respectively. The treatment T_9 (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. [8] in Guava.

3.17 Seedling Height at 30 Days after Transplanting

At 30 days after transplanting significantly maximum seedling height (14.67 cm) was observed in treatment T_3 (IBA 7500 ppm) which were found at par with the treatments T_7 (IBA 2500 ppm + NAA 2500 ppm) (13.83 cm), T1 (IBA 2500 ppm) (13.33 cm) and T6 (NAA 5000 ppm) (12.63 cm) fallowed by treatments T_8 (IBA 5000 ppm + NAA 5000 ppm) (12.22 cm) and T5 (NAA 2500 ppm) (11.97 cm) respectively. The treatment T_9 (Control) recorded significantly minimum seedling height (11.22cm).

3.18 Seedling Height at 60 Days after Transplanting

At 60 days after transplanting significantly maximum seedling height (21.68cm) was observed in treatment T_3 (IBA 7500 ppm) which were found at par with the treatments T_7 (IBA 2500 ppm + NAA 2500 ppm) (20.83 cm), T1 (IBA 2500 ppm) (20.16cm) and T_8 (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 T_9 (Control) recorded significantly minimum seedling height (17.54 cm).

3.19 Seedling Height at 90 Days after Transplanting

At 90 days after transplanting significantly maximum seedling height (27.66 cm) was observed in treatment T_3 (IBA 7500 ppm) which was 12.44 per cent increased as compared to control however which were found at par with the treatments T_7 (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 T_8 (IBA 5000 ppm + NAA 5000 ppm) (25.22 cm) respectively. The treatment T_9 (Control) recorded significantly minimum seedling height (24.22 cm).

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

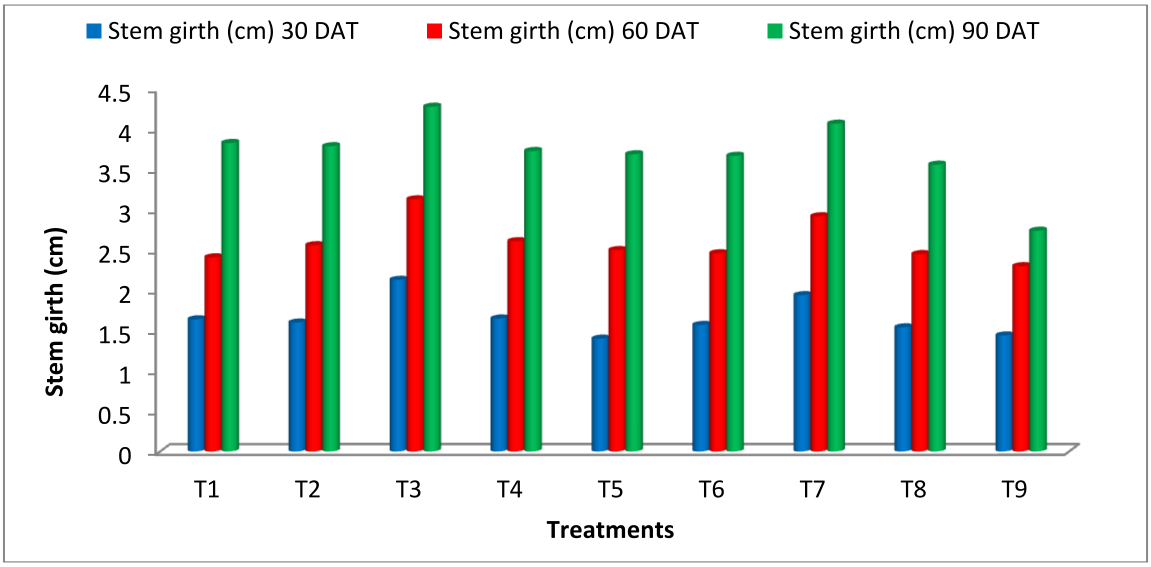

Fig. 6. Effect of different growth regulators on air layering in fig on stem girth (cm)

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

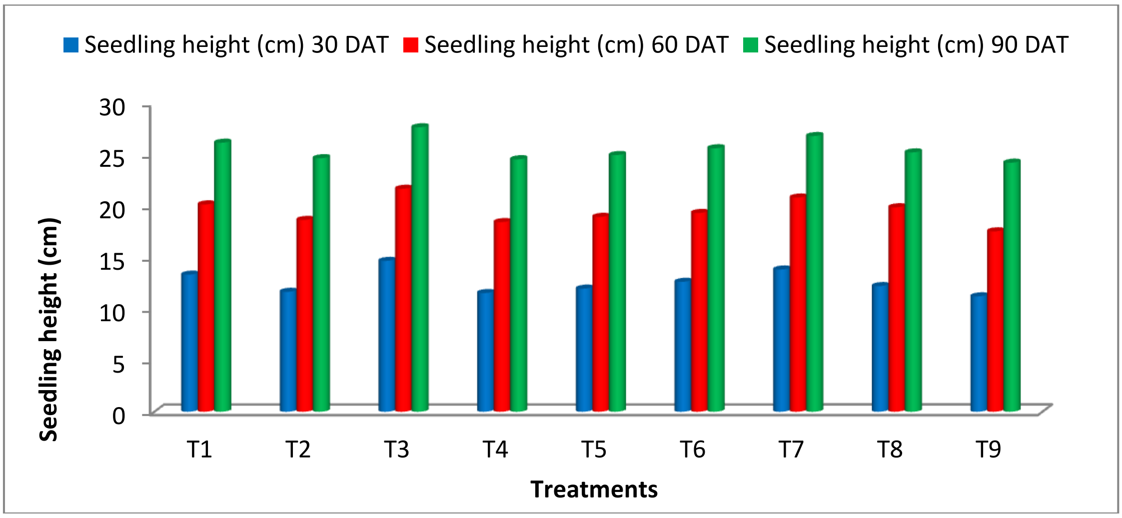

Fig. 7. Effect of different growth regulators on air layering in fig on seedling height (cm)

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 [10] in pomogranate, Khapare et al. [11] in fig, Singh et al. [12] in barbados cherry.

3.20 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.

The significantly maximum success per cent (96.33%) was observed in treatment T_3 (IBA 7500 ppm) which was 19.82 per cent increased as compared to control however which was found at par with the treatment T_7 (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 T_9 (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 resuling in higher survival percentage of air layering in fig.

These findings are in agreement with the findings of Ganpati et al. [6] in tamarind, Kumar and Syamal [13] and Maurya et al. [2] in guava.

3.21 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 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

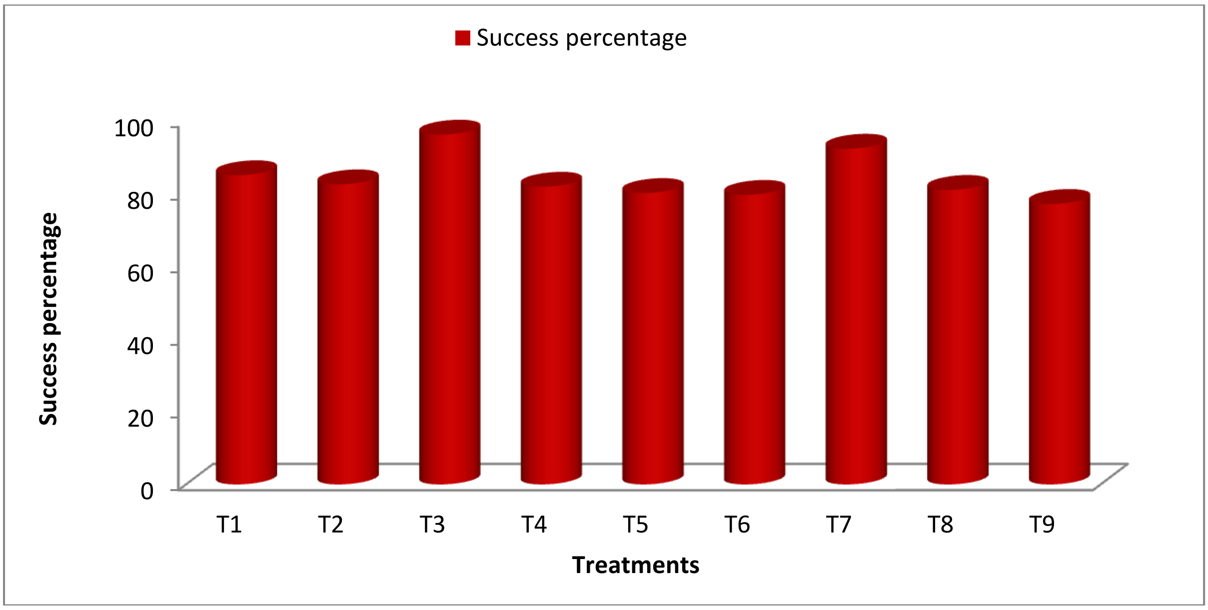

Fig. 8. Effect of different growth regulators on air layering in fig on success Percent (%)

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±	0.06
	CD at 5% level	0.20

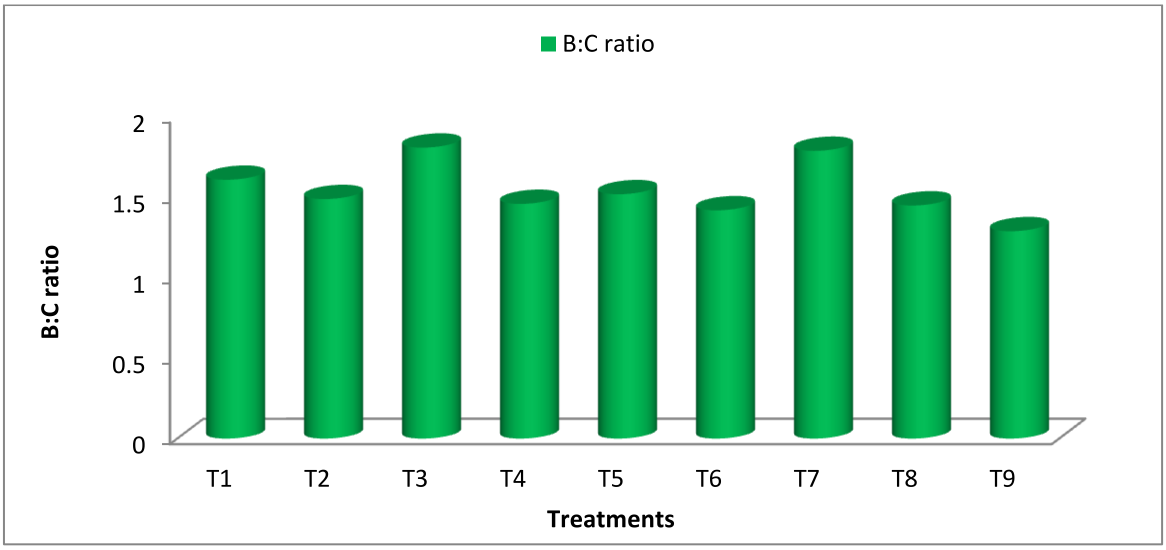

Fig. 9. Effect of different growth regulators on air layering in fig on B:C ratio

The significantly maximum benefit cost ratio (1.81) was observed in treatment T_3 (IBA 7500 ppm) which was 28.73 per cent increased as compared to control however which were found at par with the treatments T_7 (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 T_9 (Control) recorded significantly minimum benefit cost ratio (1.29).

The result in are in conformity with those reported by Maurya et al. [2] in guava, Bhosale et al*.* [14] in pomegranate and Reddy et al. (2014) in fig.

4. 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 T_3 (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 T_7 (IBA 2500 ppm + NAA 2500 ppm fallowed by treatments T1 (IBA 2500 ppm), T5 (NAA 2500 ppm) and treatment T_9 (control) recorded significantly minimum value in air layering in figc 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.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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