International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(5): 3207-3214

Received: 14-07-2018
Accepted: 18-08-2018

DK Aghera
Department of Horticulture, College of Agriculture Junagadh Agricultural University, Junagadh, Gujarat, India

AN Makwana
Department of Horticulture, College of Agriculture Junagadh Agricultural University, Junagadh, Gujarat, India

Correspondence
AN Makwana
Department of Horticulture, College of Agriculture Junagadh Agricultural University, Junagadh, Gujarat, India

Effect of IBA concentrations and types of media on sprouting and shoot growth of cutting in fig (*Ficus carica* L.) CV. Poona fig

DK Aghera and AN Makwana

Abstract
The field experiment entitled "Effect of IBA concentrations and types of media on sprouting and shoot growth of cutting in fig (*Ficus carica* L.) Cv. Poona fig." was carried out at Fruit Research Station, Madhadi Baug Farm, Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh during 2015-16.

The experiment was laid out in a Completely Randomized Design with Factorial concept with three repetitions. The treatment consist of five level of IBA concentration I_1 (Control), I_2 (IBA 2000 ppm), I_3 (IBA 2500 ppm), I_4 (IBA 3000 ppm) and I_5 (IBA 3500 ppm) and three level of different media M_1 (soil), M_2 (sand) and M_3 [soil + sand (1:1)].

Among the different IBA concentration, I_2 (IBA 2000 ppm) recorded significantly the minimum days to shoot sprouting (11.50 days), maximum sprouting percentage (85.57% and 83.12%) at 30 and 60 DAP, respectively and maximum number of leaves (5.49, 8.30 and 10.74), number of shoots (2.37, 3.71 and 3.95), length of main shoot (3.19 cm, 5.67 cm and 8.32 cm), diameter of main shoot (2.50 mm, 3.43 mm and 4.66 mm) at 30, 60 and 90 DAP, respectively while maximum fresh weight of shoots(5.52 g), dry weight of shoots(3.76 g) at 90 DAP.

Among the factor media M_3 [Soil + Sand (1:1)] recorded significantly the minimum days to shoot sprouting (13.70 days), maximum sprouting percentage (83.44% and 80.41%) at 30 and 60 DAP, respectively and maximum number of leaves (5.62, 7.15 and 9.74), number of shoots (2.27, 3.23 and 3.32), length of main shoot (3.99 cm, 6.49 cm and 8.85 cm) and diameter of main shoot (2.29 mm, 2.99 mm and 4.19 mm) at 30, 60 and 90 DAP, respectively while maximum fresh weight of shoots (4.63 g), dry weight of shoots (2.90 g) at 90 DAP.

The interaction effect between the IBA and media were found significant in parameters like; minimum day to shoot sprouting (10.16 days), maximum sprouting percentage (91.66% and 89.33%) at 30 and 60 DAP, respectively and maximum number of leaves (6.80, 8.63 and 11.10), length of main shoot (4.22 cm, 7.43 cm and 10.76 cm) and diameter of main shoot (2.80 mm, 3.76 mm and 5.13 mm) at 30, 60 and 90 DAP, respectively while maximum fresh weight of shoots (5.90 g), dry weight of shoots (3.91 g) at 90 DAP were recorded under I_2M_3 treatment combination.

Cutting treated with IBA 2000 ppm and planted in soil + sand (1:1) media was found better for the propagation of fig through cutting.

Keywords: fig, media, IBA, cutting

Introduction
Fig (*Ficus carica* L.) is an ancient and an important deciduous fruit crop in tropical and subtropical countries. It belongs to the family "Moraceae", which includes trees, shrubs and climbers with milky juice. It is widely distributed throughout the tropics of both hemispheres, but particularly abundant in the South-East Asia and Polynesia. The original home of fig is believed to be Southern Arabia. The genus Ficus is a large one containing more than 1000 species, out of which about 65 species are found in India. In the world, the area under fig cultivation is 4,15,780 hectares with production of 10,47,230 MT (Anon., 2015) [3]. Egypt is the leading fig producing country followed by Turkey, Algeria, Morocco and Iran. The area under cultivation of fig in India is nearly 3,570 hectare with production of 14,643 MT, where in Maharashtra is the leading state followed by Karnataka (Anon., 2015) [3]. It is minor fruit crop in Northern India.

Fig contains various medicinal properties, as it works as a laxative and appetizer. A fresh or dry fig with warm water, if taken before sleep, brings a good healthy result within five to seven day. According to ayurved, dry fig proves to be beneficial to cure the problem of insomnia

(Sleeplessness). A fig proves to be useful to get the rid of constipation, thus, the physical problem arising due to constipation can be prevented.

Fig being a deciduous and sub tropical tree, prefers areas having arid or semiarid environment, high summer temperature, plenty of sunshine and moderate water. Although the plants can survive temperature as high 45 ^{0}C, the fruit quality deteriorates beyond 39 ^{0}C. Though the mature tree can withstand low temperature up to 40 ^{0}C, it makes good growth when the temperature is above 15 – 21 ^{0}C. The size, shape, colour of the skin and pulp quality are markedly affected by climate. But quality figs are produced in the region with dry climate especially at the time of fruit development and maturity. High humidity coupled with low temperature usually results in fruit splitting and low fruit quality.

Fig is propagated through both sexual and asexual methods. In sexual method, seed is employed only to produce new varieties by hybridization and for rootstock purposes. In asexual method, it can be successfully propagated by cutting, layering, and grafting. Among all the asexual techniques, the cutting is the easiest and economical method of producing true to type plants, but rooting in hard wood cutting is the fundamental problem in the practical application. For this use of plant growth regulators is most important.

The growth substance most commonly used for better rooting in cutting of various plant parts are IAA, IBA, NAA etc. Among these auxins, IBA has proved to be the best for proper root growth and are widely used for successful rooting of cuttings. While growth substance given good results and their effectiveness varied according to species. A wide spread use of growth regulators by nurserymen, florists and horticulturist indicates that the growth substance are valuable aid to rooting in cutting. Rooting media is one of the most important factors for better rooting of cutting and survival of plant. There are different media like soil, sand, perlite, vermiculite, FYM etc. play an important role in success of rooting of cutting. Some media have higher moisture holding capacity with lighter weight, which enhance root formation.

Availability of quality planting material is current issue in fig. Normally it is propagated by cutting. Many techniques evolved for easy rooting in cutting however; there is further need for development of rooting technique. There is great role of various plant growth regulators particularly IBA and different types of media for rooting as well as survival of cuttings, so to know the effect of IBA concentration and types of media on rooting and survival of cutting in fig.

There is a very scars research was done for rooting in cutting and media for better rooting in Saurashtra region. Hence, considering the above facts, the present experiment will be undertaken as: "Effect of IBA concentrations and types of media on sprouting and shoot growth of cutting in fig (*Ficus carica* L.) cv. Poona fig"

Materials and Methods

Location

The experiment was carried out at the Fruit Research Station, Madhadi Baug Farm, Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh, during 15th May to 15th September 2016. Junagadh is situated at 21^0 50' N latitude and 70^0 50' E longitude with an altitude of 60 meters above the mean sea level and 80 km away from the Arabian Sea Coast.

Climate

Climate of this region is typically sub tropical characterized by fairly cool and dry winter, hot and dry summer and warm and moderately humid monsoon. The rainy season commences by third week of June and ends in first week of October. July and August were the months of heavy precipitation. Winter sets in the month of November and continues till the month of February. Summer commence in the first fortnight of March and ends in the middle of June. May was the hottest months of the summer. The meteorological data on maximum temperatures, minimum temperatures and relative humidity during the course of experiment were recorded at the meteorological observatory, Junagadh Agricultural University, Junagadh. The experiment was taken during 15th May to 15th September month period.

Treatment details

Factor A: IBA Concentration

I_1 : Control
I_2 : IBA 2000 ppm
I_3 : IBA 2500 ppm
I_4 : IBA 3000 ppm
I_5 : IBA 3500 ppm

Factor B: Types of media

M_1 : Soil
M_2 : Sand
M_3 : Soil + Sand (1:1)

Treatment combination

T_1: I_1M_1	Control + Soil
T_2: I_1M_2	Control + Sand
T_3: I_1M_3	Control + Soil + Sand (1:1)
T_4: I_2M_1	IBA 2000 ppm + Soil
T_5: I_2M_2	IBA 2000 ppm + Sand
T_6: I_2M_3	IBA 2000 ppm + Soil + Sand (1:1)
T_7: I_3M_1	IBA 2500 ppm + Soil
T_8: I_3M_2	IBA 2500 ppm + Sand
T_9: I_3M_3	IBA 2500 ppm + Soil + Sand (1:1)
T_{10}: I_4M_1	IBA 3000 ppm + Soil
T_{11}: I_4M_2	IBA 3000 ppm + Sand
T_{12}: I_4M_3	IBA 3000 ppm + Soil + Sand (1:1)
T_{13}: I_5M_1	IBA 3500 ppm + Soil
T_{14}: I_5M_2	IBA 3500 ppm + Sand
T_{15}: I_5M_3	IBA 3500 ppm + Soil + Sand (1:1)

Preparation of growth regulators solution

The required quantity of IBA was taken and dissolved in a small quantity of 95 per cent absolute alcohol. Finally, 1000 ml volume of stock solution for 2000, 2500, 3000 and 3500 ppm of growth regulators were prepared by adding distilled water. The required quantity of stock solution was taken and diluted with distilled water to make required strength *viz*., 2000, 2500, 3000 and 3500 ppm of IBA.

Preparation of cuttings

The cuttings were prepared from one year old healthy hardwood shoots having a thickness 0.8 to 1.0 cm. The cuttings of 20-25 cm length were prepared. The lower cut of each cutting was made slanting just below the node. The cut was given in water to avoid entry of air bubbles into the vascular system.

Treatment application and planting of cuttings

The basal part end of each cutting up to 5 cm was dipped in the respective solution of IBA for 2 minutes. Each cutting was inserted up to two third of its length into the bag filled with different media as per treatment allocation.

Observations recorded
Observations should be recorded with appropriate procedure.

Result and Discussion
Effect on sprouting parameters of cutting
Effect of IBA concentration and types of media on days to shoot sprouting, sprouting percentage and number of leaves are given in Table 1, 2 and 3.

Effect of IBA concentration
Result presented in Table 1, 2 and 3 clearly showed that the IBA concentration significantly influenced on days to shoot sprouting, sprouting percentage of cutting at 30 and 60 DAP and number of leaves at 30, 60 and 90 DAP. Minimum days taken for sprouting (11.50 days) were observed in treatment I_2 (IBA 2000 ppm) which was found at par with I_3 (IBA 2500 ppm) while, maximum days to shoot sprouting (20.14 days) were recorded in treatment I_1 (Control). The maximum sprouting percentage (85.57 and 83.12%) was observed in I_2 (IBA 2000 ppm) at 30 and 60 DAP, respectively which was found at par with I_3 (IBA 2500 ppm) at 30 and 60 DAP while, minimum sprouting percentage (71.33 and 67.50%) was recorded in I_1 (Control) at 30 and 60 DAP, respectively. The maximum number of leaves (5.49, 8.30 and 10.74) was observed in I_2 (IBA 2000 ppm) at 30, 60 and 90 DAP, respectively which was at par with I_3 (IBA 2500 ppm) at 30 and 90 DAP. This result might be due to the fact that, better utilization of stored carbohydrates, nitrogen and other factors with the help of growth regulators.

Effect of types of media
The result revealed that effect of types of growing media was found effective on days to shoot sprouting, sprouting percentage of cutting at 30 and 60 DAP and number of leaves at 30, 60 and 90 DAP. The minimum days to shoot sprouting (13.70 days) was observed in media M_3 containing (soil + sand). Maximum days to shoot sprouting (14.97 days) were recorded in treatment M_1 containing (soil). Whereas, the maximum sprouting percentage (83.44 and 80.41%) was reported in media M_3 (soil + sand) at 30 and 60 DAP, respectively. While minimum sprouting percentage (76.89 and 73.79%) was recorded in treatment media M_1 (soil) at 30 and 60 DAP, respectively. The maximum number of leaves (5.62, 7.15 and 9.74) was recorded in media M_3 (soil + sand) at 30, 60 and 90 DAP, respectively which was found at par with M_2 (sand) at 60 DAP. This result might be due to the larger pore size and good aeration capacity of the media.

Interaction effect of IBA concentration and types of media
Interaction effect of IBA concentration and types of media on days to shoot sprouting, sprouting percentage of cutting at 30 and 60 DAP and number of leaves at 30, 60 and 90 DAP are presented in Table 1.1, 2.1, 2.2, 3.1, 3.2 and 3.3. The minimum days to shoot sprouting (10.16 days) was observed in treatment I_2M_3, which was found at par with I_3M_3, while maximum days to shoot sprouting (21.23 days) was recorded in I_1M_3. The maximum sprouting percentage (91.66 and 89.33%) was recorded in the treatment combination I_2M_3 at 30 and 60 DAP, respectively which was found at par with treatment I_3M_3 at 30 and 60 DAP. The minimum sprouting percentage (67.66 and 63.66%) was recorded under the treatment combination I_1M_1 at 30 and 60 DAP, respectively. The maximum number of leaves (6.80, 8.63 and 11.10) were observed in treatment I_2M_3 at 30, 60 and 90 DAP, respectively, which was found at par with I_2M_2 at 60 DAP and I_3M_3 at 90 DAP. Whereas, minimum number of leaves (3.80) were observed in I_4M_1 at 30 DAP and (5.80 and 11.10) was recorded in I_1M_1 at 60 and 90 DAP, respectively.
This might be due to the macrospores and good aeration capacity of the media suitable for early sprouting and auxins, which are known to induce stimulus for regeneration of roots by promotion of hydrolysis, mobilization and utilization of nutritional reserves in the region of root and shoot formation.

Table 1: Effect of different IBA concentration and types of media on days to shoot sprouting of fig cutting

Treatment	Days to shoot sprouting
IBA Concentration (I)	
I_1 : Control	20.14
I_2 : IBA 2000 ppm	11.50
I_3 : IBA 2500 ppm	11.84
I_4 : IBA 3000 ppm	15.51
I_5 : IBA 3500 ppm	13.48
S.Em. ±	0.17
C. D. at 5%	0.48
Types of media (M)	
M_1 : Soil	14.97
M_2 : Sand	14.82
M_3 : Soil + Sand (1:1)	13.70
S.Em. ±	0.13
C. D. at 5%	0.37
Interaction (I × M)	
S.Em. ±	0.29
C. D. at 5%	0.83
C.V. %	3.44

Table 1.1: Interaction effect of different IBA concentration and types of media on days to shoot sprouting of fig cutting

Media (M) / IBA (I)	M_1 : Soil	M_2 : Sand	M_3 : Soil + Sand (1:1)	Mean (I)
I_1 : Control	21.23	20.00	19.20	20.14
I_2 : IBA 2000 ppm	12.60	11.73	10.16	11.50
I_3 : IBA 2500 ppm	12.76	11.80	10.96	11.84
I_4 : IBA 3000 ppm	14.60	17.60	14.33	15.51
I_5 : IBA 3500 ppm	13.63	12.96	13.83	13.47
Mean (M)	14.96	14.82	13.70	
S.Em. ±	0.29			
C. D. at 5%	0.83			
C.V. %	3.44			

Table 2: Effect of different IBA concentration and types of media on sprouting percentage of fig cutting at 30 and 60 DAP

Treatment	Sprouting percentage (%)	
	30 DAP	60 DAP
IBA Concentration (I)		
I_1 : Control	71.33	67.50
I_2 : IBA 2000 ppm	85.57	83.12
I_3 : IBA 2500 ppm	84.12	81.19
I_4 : IBA 3000 ppm	79.27	75.60
I_5 : IBA 3500 ppm	80.01	78.11
S.Em. ±	0.87	0.86
C. D. at 5%	2.53	2.47
Types of media (M)		
M_1 : Soil	76.89	73.79
M_2 : Sand	79.85	77.12
M_3 : Soil + Sand (1:1)	83.44	80.41
S.Em. ±	0.68	0.66
C. D. at 5%	1.96	1.92
Interaction (I × M)		
S.Em. ±	1.52	1.48
C. D. at 5%	4.38	4.29
C.V. %	3.28	3.33

Table 2.1: Interaction effect of different IBA concentration and types of media sprouting percentage of fig cutting at 30 DAP

Media(M) / IBA(I)	M_1 : Soil	M_2 : Sand	M_3 : Soil + Sand (1:1)	Mean (I)
I_1 : Control	67.66	75.00	71.33	71.33
I_2 : IBA 2000 ppm	82.00	83.03	91.66	85.56
I_3 : IBA 2500 ppm	82.10	82.56	87.70	84.12
I_4 : IBA 3000 ppm	76.66	78.66	82.46	79.26
I_5 : IBA 3500 ppm	76.00	80.00	84.03	80.01
Mean (M)	76.88	79.85	83.44	
S.Em. ±	1.52			
C. D. at 5%	4.38			
C.V. %	3.28			

Table 2.2: Interaction effect of different IBA concentration and types of media sprouting percentage of fig cutting at 60 DAP

Media(M) / IBA(I)	M_1 : Soil	M_2 : Sand	M_3 : Soil + Sand (1:1)	Mean (I)
I_1 : Control	63.667	71.333	67.500	67.500
I_2 : IBA 2000 ppm	79.000	81.033	89.333	83.122
I_3 : IBA 2500 ppm	79.100	79.400	85.067	81.189
I_4 : IBA 3000 ppm	72.667	75.667	78.467	75.600
I_5 : IBA 3500 ppm	74.500	78.167	81.667	78.111
Mean (M)	73.787	77.120	80.407	
S.Em. ±	1.48			
C. D. at 5%	4.29			
C.V. %	3.33			

Table 3: Effect of different IBA concentration and types of media on number of leaves per shoot of fig cutting at 30, 60 and 90 DAP

Treatment	Number of leaves		
	30 DAP	60 DAP	90 DAP
IBA Concentration (I)			
I_1 : Control	4.34	5.96	7.51
I_2 : IBA 2000 ppm	5.49	8.30	10.74
I_3 : IBA 2500 ppm	5.34	7.32	10.60
I_4 : IBA 3000 ppm	4.67	6.60	8.86
I_5 : IBA 3500 ppm	4.88	6.73	9.57
S.Em. ±	0.06	0.08	0.06
C. D. at 5%	0.17	0.23	0.18
Types of media (M)			
M_1 : Soil	4.19	6.74	9.14
M_2 : Sand	5.02	7.05	9.49
M_3 : Soil + Sand (1:1)	5.62	7.15	9.74
S.Em. ±	0.05	0.06	0.05
C. D. at 5%	0.13	0.17	0.14
Interaction (I × M)			
S.Em. ±	0.10	0.13	0.11
C. D. at 5%	0.30	0.38	0.32
C.V. %	3.61	3.29	2.03

Table 3.1 Interaction effect of different IBA concentration and types of media number of leaves per shoot of fig cutting at 30 DAP

Media(M) / IBA(I)	M_1 : Soil	M_2 : Sand	M_3 : Soil + Sand (1:1)	Mean (I)
I_1 : Control	4.20	4.40	4.43	4.34
I_2 : IBA 2000 ppm	4.46	5.20	6.80	5.48
I_3 : IBA 2500 ppm	4.20	5.76	6.06	5.34
I_4 : IBA 3000 ppm	3.80	4.70	5.50	4.66
I_5 : IBA 3500 ppm	4.30	5.03	5.30	4.87
Mean (M)	4.19	5.02	5.62	
S.Em. ±	0.10			
C. D. at 5%	0.30			
C.V. %	3.61			

Table 3.2: Interaction effect of different IBA concentration and types of media number of leaves per shoot of fig cutting at 60 DAP

Media(M) / IBA(I)	M_1 : Soil	M_2 : Sand	M_3 : Soil + Sand (1:1)	Mean (I)
I_1 : Control	5.80	6.03	6.03	5.95
I_2 : IBA 2000 ppm	7.86	8.40	8.63	8.30
I_3 : IBA 2500 ppm	7.03	7.76	7.16	7.32
I_4 : IBA 3000 ppm	6.20	6.80	6.80	6.60
I_5 : IBA 3500 ppm	6.80	6.26	7.13	6.73
Mean (M)	6.74	7.05	7.15	
S.Em. ±	0.12			
C. D. at 5%	0.37			
C.V. %	3.29			

Table 3.3: Interaction effect of different IBA concentration and types of media number of leaves per shoot of fig cutting at 90 DAP

Media(M) / IBA(I)	M_1 : Soil	M_2 : Sand	M_3 : Soil + Sand (1:1)	Mean (I)
I_1 : Control	7.20	7.50	7.83	7.51
I_2 : IBA 2000 ppm	10.50	10.63	11.10	10.74
I_3 : IBA 2500 ppm	10.26	10.66	10.86	10.60
I_4 : IBA 3000 ppm	8.53	8.50	9.53	8.85
I_5 : IBA 3500 ppm	9.20	10.13	9.36	9.56
Mean (M)	9.14	9.48	9.74	
S.Em. ±	0.11			
C. D. at 5%	0.32			
C.V. %	2.03			

Effect on shoots growth parameters of cutting

The effect of IBA concentration and types of media on growth parameters like number of shoots, length of main shoot, diameter of main shoot, fresh weight of shoot and dry weight of shoot of cutting are given in Table 4, 5 and 6.

Effect of IBA concentration

The number of shoots, length and diameter of main shoot per cutting at 30, 60 and 90 DAP and fresh and dry weight of shoot at 90 DAP were significantly influenced by different IBA concentration.

The maximum number of shoots (2.37, 3.71, and 3.95) recorded in treatment I_2 (IBA 2000 ppm) at 30, 60 and 90 DAP, respectively. Whereas, minimum number of shoots (1.21, 1.64 and 2.77) recorded in treatment I_1 (Control) at 30, 60 and 90 DAP respectively.

The maximum length of main shoot (3.19, 5.67 and 8.32 cm) recorded in treatment I_2 (IBA 2000ppm) at 30, 60 and 90 DAP, respectively which was found at par with I_3 (IBA 2500ppm) at 30, 60 and 90 DAP respectively. Whereas, minimum length of main shoot (2.48, 3.54 and 5.94 cm) recorded in treatment I_1 (Control) at 30, 60 and 90 DAP, respectively.

The maximum diameter of main shoot (2.50, 3.43 and 4.66 mm) recorded in treatment I_2 (IBA 2000 ppm) at 30, 60 and 90 DAP, which was found at par with I_3 (IBA 2500 ppm) at 30, 60 and 90 DAP, respectively. Whereas, minimum diameter of main shoot (1.42, 2.01 and 2.89 mm) recorded in treatment I_1 (Control) at 30, 60 and 90 DAP, respectively.

The maximum fresh and dry weight of shoots (5.52 and 3.76 g) recorded in treatment I_2 (IBA 2000 ppm) at 90 DAP. Whereas, minimum fresh and dry weight of shoot (2.47 and 1.52 g) recorded in I_1 (Control) at 90 DAP.

This may be attributed to the fact that growth attributes in term of root and shoot growth parameters affected by exogenous application of required growth regulators. This is depicted in lowest physiological activity for triggering root initiation and development and finally all other growth

parameter of cuttings was seriously affected. This may be due low activity of growth substance and low physiological activity.

Effect of types of media

Considerable differences were found on growth parameters due to different media. The maximum number of shoot (2.27, 3.23 and 3.32) per cutting recorded in media M_3 (soil + sand) at 30, 60 and 90 DAP, respectively. Whereas minimum number of shoot (1.69, 1.91 and 2.97) per cutting recorded in media M_1 (sand) at 30, 60 and 90 DAP, respectively.

The maximum length of main shoot (3.99, 6.49 and 8.85 cm) per cutting recorded in media M_3 (soil + sand) at 30, 60 and 90 DAP, respectively. Whereas, minimum length of main shoot (1.75, 3.18 and 5.28 cm) per cutting recorded in media M_1 (sand) at 30, 60 and 90 DAP, respectively.

The maximum diameter of main shoot (2.29, 2.99 and 4.19 mm) per cutting recorded in media M_3 (soil + sand) at 30, 60 and 90 DAP, respectively. Whereas minimum diameter of main shoot (1.80, 2.49 and 3.53 cm) per cutting recorded in media M_1 (sand) at 30, 60 and 90 DAP, respectively.

The maximum fresh and dry weight of shoots (4.63 and 2.90 g) per cutting recorded in media M_3 (soil + sand) at 90 DAP, respectively. Whereas minimum fresh and dry weight of shoots (3.79 and 2.38 g) per cutting were recorded in media M_1 (sand) at 90 DAP, respectively.

This may be attributed to general improvement in the physical and chemical properties of the rooting medium, so increased absorption of nutrition may also have accelerated the process of cell division, differentiation and better nutrients availability leading to higher production of photosynthetically functional leaves and growth of plant by media.

Interaction effect of IBA concentration and types of media

The interaction effect of IBA concentration and types of media on length and diameter of main shoot at 30, 60 and 90 DAP and fresh and dry weight of shoot per cutting at 90 DAP are presented in Table 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 6.1 and 6.2.

Interaction effect for number of shoots were found non significant. The maximum length of main shoot (4.22, 7.43 and 10.76 cm) per cutting recorded in treatment I_2M_3 at 30, 60 and 90 DAP, respectively which was found at par with I_3M_3 at 30 and 60 DAP. The minimum length of main shoot (1.66 cm) per cutting recorded in treatment I_4M_1 at 30 DAP, and (2.80 and 4.20 cm) was recorded in treatment I_2M_3 at 60 and 90 DAP, respectively.

The maximum diameter of main shoot (2.80, 3.76 and 5.13 mm) per cutting recorded in treatment I_2M_3 at 30, 60 and 90 DAP, respectively. The minimum diameter of main shoot (1.06, 1.53 and 2.66 mm) per cutting recorded in treatment I_2M_3 at 30, 60 and 90 DAP, respectively.

The maximum fresh and dry weight of shoots (5.90 and 3.91 g) per cutting recorded in treatment I_2M_3 at 90 DAP, respectively. The minimum fresh and dry weight of shoots (1.80 and 0.88 g) per cutting recorded in treatment I_1M_1 at 90 DAP, respectively.

This may be due to combination of a perfect media which is favorable for better growth of cutting by increasing the nutrients and water availability of the plant. IBA, which increase the number of shoots resulting in higher growth of cutting. Better nutrient availability and more number of shoots leading to higher production of photo synthetically functional leaves and growth of cutting by media.

Table 4: Effect of different IBA concentration and types of media on number of shoot per cutting of fig at 30, 60 and 90 DAP

Treatment	Number of shoots		
	30 DAP	60 DAP	90 DAP
IBA Concentration (I)			
I_1 : Control	1.21	1.64	2.77
I_2 : IBA 2000 ppm	2.37	3.71	3.95
I_3 : IBA 2500 ppm	2.26	2.69	3.47
I_4 : IBA 3000 ppm	1.65	1.68	2.62
I_5 : IBA 3500 ppm	2.03	2.60	2.91
S.Em. ±	0.03	0.04	0.05
C. D. at 5%	0.08	0.11	0.15
Types of media (M)			
M_1 : Soil	1.69	1.91	2.97
M_2 : Sand	1.83	2.40	3.14
M_3 : Soil + Sand (1:1)	2.27	3.23	3.32
S.Em. ±	0.02	0.03	0.04
C. D. at 5%	0.06	0.09	0.11
Interaction (I × M)			
S.Em. ±	0.04	0.06	0.08
C. D. at 5%	NS	NS	NS
C.V. %	4.53	4.7	4.81

Table 5: Effect of different IBA concentration and types of media on length (cm) and Diameter (mm) of main shoot per cutting of fig at 30, 60 and 90 DAP

Treatment	Length of main shoot (cm)			Diameter of main shoot (mm)		
	30 DAP	60 DAP	90 DAP	30 DAP	60 DAP	90 DAP
IBA Concentration (I)						
I_1 : Control	2.48	3.54	5.94	1.42	2.01	2.89
I_2 : IBA 2000 ppm	3.19	5.67	8.32	2.50	3.43	4.66
I_3 : IBA 2500 ppm	3.12	5.51	8.20	2.41	3.37	4.57
I_4 : IBA 3000 ppm	2.77	4.82	6.94	1.74	2.23	3.50
I_5 : IBA 3500 ppm	2.88	4.83	6.99	2.18	2.69	3.58
S.Em. ±	0.04	0.06	0.05	0.03	0.03	0.04
C. D. at 5%	0.12	0.18	0.15	0.09	0.10	0.10
Types of media (M)						
M_1 : Soil	1.75	3.18	5.28	1.80	2.49	3.53
M_2 : Sand	2.92	4.95	7.71	2.06	2.76	3.79
M_3 : Soil + Sand (1:1)	3.99	6.49	8.85	2.29	2.99	4.19
S.Em. ±	0.03	0.05	0.04	0.02	0.03	0.03
C. D. at 5%	0.09	0.14	0.12	0.07	0.07	0.08
Interaction (I ×M)						
S.Em. ±	0.07	0.11	0.09	0.05	0.05	0.06
C. D. at 5%	0.21	0.32	0.27	0.15	0.16	0.18
C.V. %	4.28	3.92	2.21	4.51	3.64	2.83

Table 5.1: Interaction effect of different IBA concentration and types of media on length of main shoot per cutting (cm) of fig at 30 DAP

Media(M) / IBA(I)	M_1 : Soil	M_2 : Sand	M_3 : Soil + Sand (1:1)	Mean (I)
I_1 : Control	1.76	2.26	3.40	2.47
I_2 : IBA 2000 ppm	1.86	3.50	4.22	3.18
I_3 : IBA 2500 ppm	1.73	3.43	4.20	3.12
I_4 : IBA 3000 ppm	1.66	2.60	3.89	2.76
I_5 : IBA 3500 ppm	1.73	2.80	3.96	2.87
Mean (M)	1.75	2.92	3.98	
S.Em. ±	0.07			
C. D. at 5%	0.21			
C.V. %	4.28			

Table 5.2: Interaction effect of different IBA concentration and types of media on length of main shoot per cutting (cm) of fig at 60 DAP

Media(M) / IBA(I)	M_1 : Soil	M_2 : Sand	M_3 : Soil + Sand (1:1)	Mean (I)
I_1 : Control	2.80	3.53	4.30	3.54
I_2 : IBA 2000 ppm	3.23	6.33	7.43	5.66
I_3 : IBA 2500 ppm	3.26	5.86	7.40	5.51
I_4 : IBA 3000 ppm	3.30	4.63	6.53	4.82
I_5 : IBA 3500 ppm	3.30	4.40	6.80	4.83
Mean (M)	3.18	4.95	6.49	
S.Em. ±	0.11			
C. D. at 5%	0.32			
C.V. %	3.92			

Table 5.3: Interaction effect of different IBA concentration and types of media on length of main shoot per cutting (cm) of fig at 90 DAP

Media(M) / IBA(I)	M_1 : Soil	M_2 : Sand	M_3 : Soil + Sand (1:1)	Mean (I)
I_1 : Control	4.20	6.76	6.86	5.94
I_2 : IBA 2000 ppm	5.36	8.83	10.76	8.32
I_3 : IBA 2500 ppm	6.26	8.13	10.20	8.20
I_4 : IBA 3000 ppm	5.36	7.23	8.23	6.94
I_5 : IBA 3500 ppm	5.20	7.60	8.16	6.98
Mean (M)	5.28	7.71	8.84	
S.Em. ±	0.09			
C. D. at 5%	0.27			
C.V. %	2.21			

Table 5.4: Interaction effect of different IBA concentration and types of media on diameter of main shoot per cutting (mm) of fig at 30 DAP

Media(M) / IBA(I)	M_1 : Soil	M_2 : Sand	M_3 : Soil + Sand (1:1)	Mean (I)
I_1 : Control	1.06	1.40	1.80	1.42
I_2 : IBA 2000 ppm	2.20	2.50	2.80	2.50
I_3 : IBA 2500 ppm	2.13	2.41	2.66	2.40
I_4 : IBA 3000 ppm	1.56	1.80	1.86	1.74
I_5 : IBA 3500 ppm	2.03	2.16	2.33	2.17
Mean (M)	1.80	2.05	2.29	
S.Em. ±	0.05			
C. D. at 5%	0.14			
C.V. %	4.51			

Table 5.5: Interaction effect of different IBA concentration and types of media on diameter of main shoot per cutting (mm) of fig at 60 DAP

Media(M) / IBA(I)	M_1 : Soil	M_2 : Sand	M_3 : Soil + Sand (1:1)	Mean (I)
I_1 : Control	1.53	2.16	2.33	2.01
I_2 : IBA 2000 ppm	3.13	3.40	3.76	3.43
I_3 : IBA 2500 ppm	3.16	3.33	3.59	3.36
I_4 : IBA 3000 ppm	2.03	2.26	2.40	2.23
I_5 : IBA 3500 ppm	2.56	2.63	2.86	2.68
Mean (M)	2.48	2.76	2.99	
S.Em. ±	0.05			
C. D. at 5%	0.16			
C.V. %	3.64			

Table 5.6: Interaction effect of different IBA concentration and types of media on diameter of main shoot per cutting (mm) of fig at 90 DAP

Media(M) / IBA(I)	M_1 : Soil	M_2 : Sand	M_3 : Soil + Sand (1:1)	Mean (I)
I_1 : Control	2.66	2.83	3.16	2.88
I_2 : IBA 2000 ppm	4.20	4.63	5.13	4.65
I_3 : IBA 2500 ppm	4.30	4.36	5.03	4.56
I_4 : IBA 3000 ppm	3.23	3.50	3.76	3.50
I_5 : IBA 3500 ppm	3.26	3.60	3.86	3.57
Mean (M)	3.53	3.78	4.19	
S.Em. ±	0.06			
C. D. at 5%	0.18			
C.V. %	2.83			

Table 6: Effect of different IBA concentration and types of media on fresh and dry weight of shoots (g) per cutting of fig at 90 DAP

Treatment	Fresh weight of shoots (g)	Dry weight of shoots (g)
IBA Concentration (I)		
I_1 : Control	2.47	1.52
I_2 : IBA 2000 ppm	5.52	3.76
I_3 : IBA 2500 ppm	5.13	3.28
I_4 : IBA 3000 ppm	3.59	2.17
I_5 : IBA 3500 ppm	4.55	2.58
S.Em. ±	0.04	0.03
C. D. at 5%	0.11	0.08
Types of media (M)		
M_1 : Soil	3.79	2.38
M_2 : Sand	4.34	2.70
M_3 : Soil + Sand (1:1)	4.63	2.90
S.Em. ±	0.03	0.02
C. D. at 5%	0.08	0.06
Interaction (I × M)		
S.Em. ±	0.06	0.05
C. D. at 5%	0.19	0.14
C.V. %	2.68	3.07

Table 6.1: Interaction effect of different IBA concentration and types of media on fresh weight of shoots (g) per cutting of fig at 90 DAP

Media(M) / IBA(I)	M_1 : Soil	M_2 : Sand	M_3 : Soil + Sand (1:1)	Mean (I)
I_1 : Control	1.80	2.67	2.93	2.46
I_2 : IBA 2000 ppm	5.06	5.58	5.90	5.51
I_3 : IBA 2500 ppm	4.56	5.23	5.60	5.13
I_4 : IBA 3000 ppm	3.33	3.60	3.83	3.59
I_5 : IBA 3500 ppm	4.20	4.60	4.86	4.55
Mean (M)	3.79	4.33	4.62	
S.Em. ±	0.06			
C. D. at 5%	0.19			
C.V. %	2.68			

Table 6.2: Interaction effect of different IBA concentration and types of media on dry weight of shoots (g) per cutting of fig at 90 DAP.

Media(M) / IBA(I)	M_1 : Soil	M_2 : Sand	M_3 : Soil + Sand (1:1)	Mean (I)
I_1 : Control	0.88	1.80	1.87	1.51
I_2 : IBA 2000 ppm	3.64	3.72	3.91	3.75
I_3 : IBA 2500 ppm	2.88	3.25	3.71	3.28
I_4 : IBA 3000 ppm	2.06	2.13	2.30	2.16
I_5 : IBA 3500 ppm	2.43	2.57	2.72	2.57
Mean (M)	2.37	2.69	2.90	
S.Em. ±	0.05			
C. D. at 5%	0.14			
C.V. %	3.07			

Conclusion

It can be concluded that IBA concentration and types of media significantly influenced the sprouting and shoot gowth of the fig cutting. The better growth of cutting found in treatment I_2M_3 at IBA 2000 ppm and planted in media soil + sand (1:1). The IBA 2000 ppm with the application of media soil + sand (1:1) was better for all the morphological parameter of growth *viz*., days to shoot sprouting, sprouting percentage, number of leaves, number of shoots per cutting, length of main shoot per cutting, diameter of main shoot per cutting and fresh and dry weight of shoot per cutting.

So, cutting of fig should be planted in media soil + sand (1:1) with the dipping in 2000 ppm IBA.

References

1. Ali SS. Effect of different media of cuttings on rooting of guava (*Psidium guajava* L.). European J Of Exp. Bio. 2014; 4(2):88-92.
2. Alikhani L, Ansari K, Jamnezhad M, Tabatabaie Z. The effect of different mediums and cuttings on growth and rooting of pomegranate cuttings. Iranian Journal of Plant Physiology. 2011; 1(3):199 -203.
3. Anonymous. Fruit production in india. Agricultural Department, Govt. of Maharashtra, Pune, 2015 @ www.mahaagri.com > accessed on 24 August, 2015.
4. Ansari K. Effect of different collecting time and different medium on rooting of Pomegranate cv. Malas torsh cuttings. Bull. Env. Pharmacol. Life. Sci. 2013; 2(12):164-168.
5. Bhuva SK. Effect of plant growth regulators on propagation of fig (*Ficus carica* L.) by hardwood and semi hardwood cuttings. M.Sc. (Hort.) thesis submitted to the Navsari Agriculture University, Navsari, 2014.
6. Chalfun NNJ, Pasqual M, Norberto PM, Dutra LF, Cavalcantealves TM. Rooting of fig (*Ficus carica* L.) cuttings: Cutting time and IBA. Acta Hort., 2008, 605.
7. Damar D, Barholia AK, Lekhi R, Halder A. Effect of growth regulators and Biofertilizers on survival of pomegranate (*Punica granatum* L.) stem cuttings. Plant Archives. 2014; 14(1):347-350.
8. Deol IS, Uppal DK. Effect of different rooting media on rooting and growth of hardwood and semi hardwood cutting of pomegranate (*Punica granatum* L.). Punjab Horti. J. 1993; 30(1-4):140-144.
9. Dhakar MK, Sarolia DK, Kaushik, Bana ML. Rooting response of Pomegranate (*Punica granatum* L.) cv. Bhagwa to different media and growth regulator. Report from "National Seminar on Tropical & Subtropical Fruits" 9-11 January 2013, held at Navsari Agriculture University, Navsari (Gujarat), 2011, 35-36.
10. Dhillon WS, Sharma KK. Effect of IBA on rooting of cutting in pomegranate. J Res. PAU. 1992; 29(3):350-353.
11. Irshad M, Rab A, Rahman J, Sajid M, Khan I, Ali S *et al*. Influence of different planting dates and media on growth of Kiwi (cv. Hayward) cuttings. Sarhad J Agriculture, 2014; 30(4):419-424.
12. Jain PK, Parmar KL. Response in hardwood cutting of pomegranate treated with rooting media, IBA and Boron. JNKVV Research Journal. 1993; 27(1):56-58.
13. Karimi HR. Stenting (cutting and grafting) a technique for propagating pomegranate (*Punica granatum* L.). J. Fruit and Orn. Plant Res. 2011; 19(2):73-79.
14. Khalis A. Effects of different collecting time and different medium on rooting of pomegranate cv. "Malastorsh" cuttings. Bulletin: Environment Pharmacology and Life Science, 2013; 2(12):164-168.
15. Khapare LS, Dahale MH, Bhusari RB. Propagational studies in fig as affected by plant growth regulator. Asian J. Hort. 2012; 7(1):118-120.
16. Nitin S, Pandey SK, Singh SS, Kumar P. Production of true to type guava plant through clonal propagation. Int. J. Of Appl. and Pure Sci. and Agri. (IJAPSA) 2015; 1(12):131-136
17. Noor R, Nabi G, Taslim J. Effect of different growth regulators and types of cutting on rootings of guava (*Psidium guajava* L.) Quarterly Science Vision. 2004; 9:1-4.
18. Panse VG, Sukhatme PV. Statistical method for agricultural workers, ICAR, New Delhi, 1995, 145-155.
19. Panwar RD, Kaushik RA, Surinder S, Gupta RB. Effect of indole butyric acid (IBA) on rooting of hard-wood cuttings in pomegranate (*Punica granatum* L.). Haryana J of Hort. Sci. 2001; 30(1, 2):72.
20. Patel AM. Effect of growth substance and preconditioning on rooting of stem cutting of pomegranate. M.Sc. (Agri.) thesis submitted to the Gujarat Agriculture University, S. K. Nagar, 1988.
21. Popovic R, Radulovic M, Cizmovic M, Velickovic M. The influence of indolebutyric acid to rhizogenic properties of mature cuttings of pomegranate (*Punica granatum* L.). Zbornik naucnih radova, 1999; 5(1):301-305.
22. Prasad RN, Singh GK. Effect of IBA on rooting of cuttings in pomegranate cv. Jalore Seedless. Scientific Horticulture. 2003; 8:31-33.
23. Rafael E. Propagation of fig tree apical cuttings: different ambient, indol butyric acid and type of cutting. *Cienc. Agrotec.* 2006; 30(5):1021-1026.
24. Ram RB, Kumar P, Kumar A. Effect of IBA and PHB on regeneration of pomegranate (*Punica granatum* L.) through stem cuttings. New-Agriculturist. 2005; 16(1, 2):113-122.
25. Ramos DP, Leonaand S, Junior ERD. Evaluation of the cutting time and growth regulators in fig cuttings. Rev. Bras. Frutic. 2008; 30(3):748-753.
26. Ratna K. Studies on the effect of IBA and rooting media on rhizogenesis of cuttings of pomegranate (*Punica granatum* L.) cv. Bhagwa under shade net conditions. M.Sc. (Agri.) thesis submitted to the Dr. Y. S. R. Horticultural University, Venkataramannagudem, Andhra Pradesh, 2014.
27. Raut UA, Bharad SG, Bhogave AF. Effect of different types of cuttings and IBA levels on pomegranate cuttings. Indian J. 2015; 16(3):526-530.
28. Reddy RKV, Reddy CP, Goud PV. Effect of auxins on the rooting of fig (*Ficus carica* L.) hardwood and semihardwood cuttings. Indian J Agric. Res. 2008a; 42(1):75-78.
29. Reddy RKV, Reddy CP, Goud PV. Role of auxins synergists in the rooting of hardwood and semi hardwood cuttings of fig (*Ficus carica* L.). Indian J Agric. Res. 2008b; 42(1):47-51.
30. Sandhu ASM, Inhas PPS, Singh SN, Kambhoj JS. Studies on rhizogenesis in hardwood cutting of pomegranate. Indian J Horti. 1991; 44(4):297-299.
31. Saroj PL, Awasthi OP, Bhargava R, Singh UV. Standardization of pomegranate propagation by cutting under mist system in hot arid region. Indian J Horti. 2008; 65(1):25-30.

32. Scaloppi EMT, Martins ABG. Clonal propagation of pomegranate (*Punica granatum* L.) by cuttings. Proceedings of the Interamerican Society for Tropical Horticulture, 2004; 47:275-276.
33. Sharma KK. Effect of IBA on rooting of guava. (*Psidium guajava* L.). Punjab Hort. J. 1975; 15(1-2): 46-47.