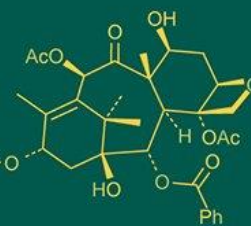
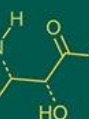
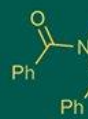


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Effect of planting time and IBA concentration on sprouting and vegetative growth parameters of fig (*Ficus carica* L.) cuttings

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Abstract

The present investigation entitled “Propagation studies in fig (*Ficus carica* L.)” was conducted during 2025-26 at the Instructional-cum-Horticulture Farm, Department of Horticulture, Mahatma Phule Krishi Vidhyapeeth, Rahuri, to standardize the suitable time for rooting of cutting and IBA concentration for successful propagation of fig. The experiment was laid out in a Factorial Completely Randomized Design with five fortnightly cutting collection dates from April to June and four IBA concentrations viz., 0, 1500, 2000 and 2500 ppm, comprising 20 treatment combinations. Hardwood cuttings of 15-20 cm length having 4-5 nodes were treated with IBA through a 15-second basal quick dip and planted in polybags containing soil, vermicompost and neem cake (2:1:1). The observations were recorded at 30, 60 and 90 days after planting (DAP). Cuttings collected during the second fortnight of April (T_2) recorded superior growth at 90 DAP with 7.32 cm shoot length, 4.76 mm shoot diameter, 4.10 leaves per cutting, 9.55 g shoot fresh weight and 148.81 cm² leaf area. Among IBA concentrations, 2000 ppm (C_3) was superior, recording 8.25 cm shoot length, 5.26 mm shoot diameter, 4.42 leaves per cutting, 11.17 g fresh weight of shoot and 174.70 cm² leaf area. The earliest sprouting was observed with 2000 ppm IBA (9.56 days), compared with 17.38 days in the untreated control. The interaction T_2C_3 (second fortnight of April with 2000 ppm IBA) produced the best overall performance, recording 5.58 mm shoot diameter, 4.90 leaves per cutting, 11.52 g shoot fresh weight and 185.45 cm² leaf area. Thus, the second fortnight of April with IBA @ 2000 ppm is best suitable treatment combination for commercial production of healthy, vigorous and uniform fig sapling.

Keywords: Fig, propagation, IBA, hardwood cuttings, shoot length

Introduction

Fig (*Ficus carica* L., Moraceae) is one of the oldest domesticated fruit crops, valued for its nutritive, medicinal and nutraceutical properties (Gani *et al.*, 2018) [4]. In India it is grown mainly in Maharashtra, Gujarat, Uttar Pradesh, Karnataka and Tamil Nadu on about 5,600 ha, with Maharashtra's Purandar belt the leading production centre (Anonymous, 2024) [1]. Being hardy, drought-and salt-tolerant, fig is well suited to dryland horticulture, yet its area expansion in India remains constrained mainly by the limited availability of genuine, true-to-type planting material.

Fig is commercially propagated through stem cuttings rather than seed, since seedlings are highly heterozygous and not true to type. Hardwood cuttings are preferred for their simplicity and low cost, but they are known to root poorly and inconsistently under normal nursery conditions, which is the principal bottleneck in commercial multiplication. Rooting of cuttings is governed jointly by endogenous factors (auxin level, carbohydrate status, physiological age of wood) and exogenous factors, of which season of cutting collection and exogenous auxin application are the most manageable. In fig, cuttings collected early in the growing season have rooted markedly better than later ones, and IBA treatment has consistently improved rooting percentage and root quality over the untreated control (Chalfun *et al.*, 2003) [2]. Among auxins, IBA is preferred for its stability and low phytotoxicity, and concentrations in the range of 2,000-3,000 ppm have given the best rooting, survival and root growth in fig across several trials (Polat and Kamilo, 2007) [8].

Materials and Methods

The experiment was conducted during 2025-26 under 50% shade net at the Instructional-cum-Horticulture Farm, Department of Horticulture, MPKV, Rahuri (19.34°N, 74.65°E; 537.37 m amsl), a semi-arid, rain-shadow location. It was laid out in a Factorial Completely Randomized Design with two factors time of cutting collection (five fortnightly dates, April-June) and IBA concentration (0, 1500, 2000, 2500 ppm) giving 20 treatment combinations, two replications and 100 hardwood cuttings per treatment each cutting is of 15-20 cm length and 4-5 nodes. Cuttings, collected from six-year-old mother plants, were basally quick-dipped in the respective IBA solution (prepared in 70% ethyl alcohol) for 15 seconds and planted in polybags containing soil, vermicompost and neem cake (2:1:1). Growth parameters viz. Days to sprouting, shoot length, shoot diameter and number of leaves were recorded at 30, 60 and 90 days were as leaf area and fresh weight of shoot were recorded at 90 days. Data analysed as per the statistical method prescribed by Panse and Sukhatme (1985) and treatments were compared using the critical difference at 5% level of significance.

Results and Discussion

Days to sprouting, as influenced by different planting time (T) and IBA concentration (C) is presented separately (Table 1). Growth of fig cuttings was further recorded periodically at 30, 60 and 90 days after planting (DAP) for shoot length, shoot diameter and number of leaves per cutting and at 90 DAP alone for fresh shoot weight and leaf area (Tables 2-4).

Days to Sprouting

Days to sprouting was significantly influenced by different planting time, IBA concentration and their interaction

(Table 1). Cuttings collected in T₁ (1st fortnight of April) sprouted earliest (11.00 days), statistically at par with T₂ (2nd fortnight of April, 11.35 days) and significantly superior to later collection dates, while T₅ (1st fortnight of June) recorded the maximum days to sprouting (13.58 days). The earlier sprouting under T₁ may be attributed to favourable microclimatic conditions optimal temperature and humidity coupled with higher stored carbohydrate reserves in the mother plant prior to the onset of active summer growth, which together stimulate enzymatic hydrolysis of reserves and hasten the breaking of bud endodormancy (Chalfun *et al.*, 2003)^[2].

Among IBA concentrations, C₃ (2000 ppm) significantly reduced the sprouting period (9.56 days), statistically at par with C₄ (2500 ppm, 9.72 days), whereas the untreated control (C₁) took the longest to sprout (17.38 days). This acceleration under IBA treatment is consistent with its known role in promoting cell division and cell elongation, hastening basal callusing, and enhancing mobilisation of carbohydrate and nitrogenous reserves toward the growing buds, thereby triggering earlier activation of dormant vegetative buds (Sheikh *et al.*, 2022 in fig; Maurya *et al.*, 2022 in lemon; Damar *et al.*, 2014 and Rathore *et al.*, 2020 in pomegranate)^[11, 6, 3, 10].

The interaction T × C was also significant. The combination T₁C₃ recorded the minimum days to sprouting (8.70 days), closely followed by T₁C₄ (9.00 days), T₄C₃ (9.50 days), T₂C₃ (9.60 days) and T₂C₄ (9.60 days), while the untreated cuttings of T₅ (T₅C₁) took the longest to sprout (23.00 days). The synergy between favourable early-season microclimatic conditions and the physiological stimulus of optimum IBA concentration likely created ideal conditions for rapid metabolic mobilisation, reducing stress on unrooted cuttings and hastening bud break.

Table 1: Effect of time of cutting (T) and IBA concentration (C) on days to sprouting in fig cuttings

Treatment	T ₁ (1 st fortnight of April)	T ₂ (2 nd fortnight of April)	T ₃ (1 st fortnight of May)	T ₄ (2 nd fortnight of May)	T ₅ (1 st fortnight of June)	Mean
C ₁ (IBA 0 ppm)	16.70	14.90	16.70	15.60	23.00	17.38
C ₂ (IBA 1500 ppm)	9.60	11.30	12.10	11.60	11.50	11.22
C ₃ (IBA 2000 ppm)	8.70	9.60	10.20	9.50	9.80	9.56
C ₄ (IBA 2500 ppm)	9.00	9.60	10.30	9.70	10.00	9.72
Mean	11.00	11.35	12.33	11.60	13.58	11.97
	T		C		T X C	
S. Em.±	0.17		0.15		0.33	
C. D. at 5%	0.46		0.41		0.92	

Growth at 30 DAP

At 30 DAP shoot length, shoot diameter and leaf number were not significantly influenced by planting time, IBA concentration or their interaction (Table 2). Numerically, however, cuttings collected in T₁ (1st fortnight of April) and

treated with C₃ (IBA @ 2000 ppm) showed the highest values for most characters, indicating that treatment effects were yet to manifest statistically at this early stage, when growth still depends largely on stored carbohydrate reserves in the cutting rather than on new root activity.

Table 2: Effect of time of cutting (T) and IBA concentration (C) on growth parameters of fig cuttings at 30 Days After Planting

Treatment	Shoot length (cm)	Shoot dia. (mm)	Leaves per cutting
T ₁ (1 st fortnight Apr)	2.22	3.38	2.21
T ₂ (2 nd fortnight Apr)	2.10	3.34	2.05
T ₃ (1 st fortnight May)	2.00	2.95	2.07
T ₄ (2 nd fortnight May)	1.82	3.06	2.06
T ₅ (1 st fortnight Jun)	2.20	3.36	1.93
S. Em.±	0.18	0.28	0.17
C. D. at 5%	NS	NS	NS
C ₁ (0 ppm)	1.51	2.37	1.85
C ₂ (1500 ppm)	2.03	3.06	1.80
C ₃ (2000 ppm)	2.44	3.80	2.55
C ₄ (2500 ppm)	2.30	3.64	2.06
S. Em.±	0.16	0.25	0.15
C. D. at 5%	NS	NS	NS
Highest (T×C)	T ₁ C ₃ 2.81	T ₅ C ₃ 4.25	T ₁ C ₃ 2.80
S. Em.±	0.37	0.56	0.33
C. D. at 5%	NS	NS	NS

Growth at 60 DAP

The effects of planting time, IBA concentration and their interaction on shoot length, shoot diameter and leaf number remained statistically non-significant at 60 DAP, although values continued to trend numerically higher under T₂ (2nd

fortnight of April) and C₃ (IBA @ 2000 ppm) than under other treatments (Table 3), reflecting the early phase of root initiation and continued reliance on stored reserves before active physiological establishment.

Table 3: Effect of time of cutting (T) and IBA concentration (C) on growth parameters of fig cuttings at 60 Days After Planting

Treatment	Shoot length (cm)	Shoot dia. (mm)	Leaves per cutting
T ₁ (1 st fortnight Apr)	4.44	4.10	2.68
T ₂ (2 nd fortnight Apr)	4.54	4.07	2.95
T ₃ (1 st fortnight May)	4.24	3.60	2.92
T ₄ (2 nd fortnight May)	3.87	3.71	2.83
T ₅ (1 st fortnight Jun)	4.48	3.96	2.94
S. Em.±	0.35	0.35	0.21
C. D. at 5%	NS	NS	NS
C ₁ (0 ppm)	3.21	2.89	2.32
C ₂ (1500 ppm)	4.18	3.72	2.72
C ₃ (2000 ppm)	5.08	4.50	3.56
C ₄ (2500 ppm)	4.79	4.43	2.86
S. Em.±	0.31	0.31	0.19
C. D. at 5%	NS	NS	NS
Highest (T×C)	T ₁ C ₃ 5.46	T ₂ C ₃ 4.77	T ₅ C ₃ 3.96
S. Em.±	0.70	0.69	0.43
C. D. at 5%	NS	NS	NS

Growth at 90 DAP

By 90 DAP shoot length, shoot diameter, number of leaves, fresh shoot weight and leaf area were all significantly influenced by planting time, IBA concentration and their interaction (Table 4). Cuttings collected in T₂ (2nd fortnight of April) produced the greatest shoot length, diameter, number of leaves, shoot fresh weight and leaf area, whereas T₄ (2nd fortnight of May) was consistently poorest an effect attributable to favourable temperature and humidity together with higher carbohydrate reserves in April-collected wood ahead of summer heat stress (Chalfun *et al.*, 2003)^[2]. Among IBA concentrations, C₃ (2000 ppm) was

significantly superior to the control and to other levels for every growth character, consistent with the role of auxin in stimulating cell division, cambial activity and mobilisation of carbohydrate and nitrogenous reserves toward the growing regions of the cutting (Kumar *et al.*, 2024; Nale *et al.*, 2024)^[5, 7]; concentrations beyond 2000 ppm gave marginally lower values for most characters. The interaction T₂C₃ recorded the overall best performance for every growth parameter, reflecting the synergy of favourable collection time and optimum auxin level in accelerating bud break and vegetative biomass accumulation before the onset of summer stress.

Table 4: Effect of time of cutting collection (T) and IBA concentration (C) on growth parameters of fig cuttings at 90 Days After Planting

Treatment	Shoot length (cm)	Shoot diameter (mm)	Leaves per cutting	Shoot fresh wt (g)	Leaf area (cm ²)
T ₁ (1 st fortnight Apr)	7.27	4.79	3.72	9.47	139.82
T ₂ (2 nd fortnight Apr)	7.32	4.76	4.10	9.55	148.81
T ₃ (1 st fortnight May)	6.86	4.21	3.13	9.17	140.46
T ₄ (2 nd fortnight May)	6.57	4.34	2.85	8.53	135.14
T ₅ (1 st fortnight Jun)	7.27	4.62	3.74	9.45	141.04
S. Em.±	0.08	0.05	0.07	0.04	0.75
C. D. at 5%	0.23	0.13	0.19	0.11	2.08
C ₁ (0 ppm)	5.18	3.38	2.68	6.94	74.95
C ₂ (1500 ppm)	6.68	4.35	3.30	8.91	142.40
C ₃ (2000 ppm)	8.25	5.26	4.42	11.17	174.70
C ₄ (2500 ppm)	8.12	5.19	3.62	9.91	172.17
S. Em.±	0.08	0.04	0.06	0.04	0.67
C. D. at 5%	0.21	0.12	0.17	0.10	1.86
Best (T×C)	T ₁ C ₃ 8.60	T ₂ C ₃ 5.58	T ₂ C ₃ 4.90	T ₂ C ₃ 11.52	T ₂ C ₃ 185.45
S. Em.±	0.17	0.09	0.14	0.08	1.50
C. D. at 5%	0.47	0.26	0.38	0.22	4.16

Conclusion

The investigation on propagation of fig (*Ficus carica* L.) revealed that both planting time and IBA concentration significantly influenced vegetative growth. The 2nd fortnight of April (T₂) proved most favourable for shoot growth, number of leaves, biomass and leaf area, while IBA @ 2000 ppm (C₃) consistently gave the fastest sprouting and best growth across all parameters. The interaction T₂C₃ produced the overall best vegetative performance. It is therefore concluded that, for optimum vegetative growth of fig hardwood cuttings, propagation should be carried out during the 2nd fortnight of April using a quick basal dip in IBA @ 2000 ppm.

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