Environment and Ecology 42 (2B) : 867—870, April—June 2024
Article DOI: https://doi.org/10.60151/envec/ZPDZ4394
ISSN 0970-0420

Efficacy of Different Concentrations of IBA and NAA on Growth of Hardwood Cuttings of Fig (*Ficus carica* L.) cv Dinkar

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Received 10 October 2023, Accepted 17 April 2024, Published on 3 June 2024

ABSTRACT

An investigation was conducted to know the influence of growth hormones on shoot growth in hardwood cuttings of fig (*Ficus carica* L.). The experiment was set up in RBD having thirty cuttings with three replications treated with different concentrations of growth hormones viz., T_1 (IBA 1000 ppm), T_2 (IBA 2000 ppm), T_3 (NAA 1000 ppm), T_4 (NAA 2000 ppm), T_5 (IBA 1000 ppm + NAA 1000 ppm), T_6 (IBA 2000 ppm + NAA 2000 ppm) along with control. Present study revealed earliest sprouting, maximum shoot diameter, shoot length and number of leaves, fresh and dry weights shoot with T_6 (IBA 2000 ppm + NAA 2000 ppm). On the basis of findings of this study fig hardwood cuttings treated with IBA 2000 ppm + NAA 2000 ppm under the shade house conditions can be recommended to nursery growers and researchers to obtain desirable shoot growth under Bundelkhand region of Uttar Pradesh.

Keywords Fig (*Ficus carica* L.), IBA, NAA, Shoot, Hardwood cuttings.

INTRODUCTION

Fig (*Ficus carica* L.) is one of the first cultivated fruits in human history that is consumed worldwide today (Desa *et al.* 2019). It belongs to the family Moraceae and sub genus Eusyce. It is widely cultivated in Mediterranean region. Fig is priced for their mild, laxative action and are used in the preparation of laxative confections and syrups and its fruits help to maintain acid alkali balance of the body. Fig is used in numerous desserts, baked products, jams, preserves as well as in some savory and meat dishes. The barks, leaves and fruits are considered to be very effective in various treatments such as diabetes, skin diseases, ulcers, dysentery, diarrhoea. Latex of the fig tree is widely used for warts, skin ulcers, sores, purgative and vermifuge (Vora *et al.* 2017).

A sexually propagated plants are very useful for replicating true to type planting material for multiplication of elite plants for plantation purpose. The plantation of fig orchards and research related to the improvement of techniques of fig tree propagation is of paramount importance for the development of

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healthy, productive and profitable fig orchards (Czaja *et al.* 2016).

Propagation of fig plants through hardwood cutting is one of the common, easy and fast techniques which depends on callus formation, initiation of roots and development of root system of the cuttings. Problem lies in very low or undesirable percentage of success. There are some endogenous factors such as growth hormones and exogenous factors such as humidity, air and light condition which determine the vegetative responses of the cuttings (Singh and Tomar 2015). Both IBA and NAA either singly or mixed together stimulate vegetative response of cuttings. Combination of auxins have been found in some instance more effective (Reddy *et al.* 2008). Hence, this investigation was conducted to find out the optimum concentration of growth hormone for desirable shoot growth of the hardwood cuttings of fig.

MATERIALS AND METHODS

The experiment was conducted at Experimental Research Farm, College of Horticulture, Banda University of Agriculture and Technology, Banda during the year 2020-2021. The experiment was set up in RBD design having thirty hardwood cuttings with three replications which were treated with different concentrations of growth hormones viz. T_1 (IBA 1000 ppm), T_2 (IBA 2000 ppm), T_3 (NAA 1000 ppm), T_4 (NAA 2000 ppm), T_5 (IBA 1000 ppm + NAA 1000 ppm), T_6 (IBA 2000 ppm + NAA 2000 ppm) and T_7 (control) under shade house conditions in a single variety of "Dinkar". The emergence of first sprouting from the treated cuttings was meticulously monitored on a daily basis under each specific treatment and the number of days required for the initial signs of sprouting to appear was duly recorded. The parameters took into account shoot diameter (cm), shoot length (cm), number of leaves at 30,60, 90 DAP and fresh and dry weight (g) of shoots were taken at 90 DAP.

RESULTS AND DISCUSSION

Number of days to first sprouting

The perusal of the data presented in Fig.1 revealed that hormonal treatments under shade house condition had a significant effect on days to first sprouting of fig cuttings.

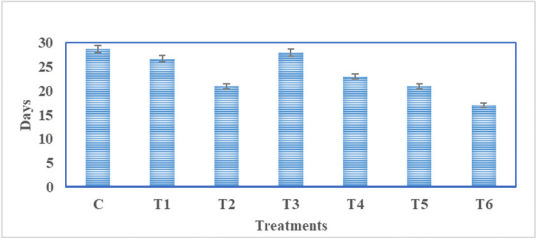

Fig. 1. Trends of the first sprouting in hardwood cuttings of fig (*Ficus carica* L.) cv Dinkar at different treatments (Control T_6).

Amongst diverse concentrations of growth hormones, initial sprouting occurred at 17 days with T_6 treatment (IBA 2000 ppm + NAA 2000 ppm), succeeded by T_5 and T_2 and T_4 treatments, exhibiting sprouting at 21 and 23 days, respectively. Conversely, the longest time for sprouting, at an average of 28.67 days, was observed in control cuttings. However, (Sheikh *et al.* 2022) recorded similar results of early sprouting in *Ficus carica* when treated with IBA @ 2000 ppm. Khapare *et al.* (2012) suggest the theory indicating that IBA functions as a hormone supportive of root development, hence accelerating root initiation and enhancing the sprouting process, supports the results. As a result, the time needed for the sprouting process to occur is reduced.

Shoot diameter and shoot length (cm)

The shoot diameter of cuttings was observed on 30 days interval viz., 30, 60 and 90 days after planting and the perusal of the data revealed that the impact of growth hormone on shoot diameter was notably significant, as shown in Table 1. The results revealed that on 30th day, maximum shoot diameter was recorded in T_6 (0.55 cm) treatment followed by T_5 (0.53 cm) and T_2 (0.52 cm) and there was steady increase in shoot diameter in all the treatments along with control. Shoot diameter was maximum in T_6 treatment among all the treatments studied on 90th day which was 1.47 folds higher than control.

Shoot length of cutting's was examined at same days intervals and an analysis of the data indicated that the effects of growth hormone were particularly

Table 1. Effect of different treatments on shoot diameter, shoot length and number of leaves of fig cv Dinkar hardwood cuttings.

Sl. No.	Treatments	Shoot diameter (cm)			Shoot length (cm)			No. of leaves		
		30 DAP	60 DAP	90 DAP	30 DAP	60 DAP	90 DAP	30 DAP	60 DAP	90 DAP
1	Control	0.273^{Dd}	0.407^{Ed}	0.527^{Ff}	1.167^{Dd}	2.480^{Ce}	6.780^{De}	1.090^{Dd}	2.507^{Dd}	6.007^{Fe}
2	T_1 (IBA @ 1000 ppm)	0.380^{BC}	0.537^{Dc}	0.607^{Ee}	1.647^{Cc}	3.587^{Bbc}	8.253^{Cd}	1.757^{Cc}	3.670^{Cd}	6.820^{Dd}
3	T_2 (IBA @ 2000 ppm)	0.517^{Aab}	0.663^{Cd}	0.783^{Cc}	1.877^{Bb}	3.680^{Bbc}	9.330^{Ab}	1.990^{Bb}	3.910^{Bb}	7.680^{Cc}
4	T_3 (NAA @ 1000 ppm)	0.350^{Cc}	0.520^{Dc}	0.610^{Ee}	1.273^{Dd}	2.627^{Cde}	7.077^{De}	1.690^{Cc}	2.890^{Dcd}	6.207^{Ee}
5	T_4 (NAA @ 2000 ppm)	0.453^{Bb}	0.637^{Cd}	0.720^{Dd}	1.927^{Bab}	3.190^{Bcd}	8.747^{Bc}	1.910^{Bbc}	3.580^{Cbc}	7.610^{Cc}
6	T_5 (IBA @ 1000 ppm + NAA @ 1000 ppm)	0.527^{Aa}	0.760^{Ba}	0.853^{Bb}	2.017^{Aab}	4.087^{Aab}	9.630^{Aab}	2.120^{Ab}	4.090^{Bab}	8.760^{Bb}
7	T_6 (IBA @ 2000 ppm + NAA @ 2000 ppm)	0.550^{Aa}	0.810^{Aa}	0.930^{Aa}	2.117^{Aa}	4.483^{Aa}	10.007^{Aa}	2.430^{Aa}	4.800^{Aa}	10.030^{Aa}
	SEM	0.023	0.019	0.016	0.072	0.220	0.149	0.075	0.235	0.173
	CD 5%	0.070	0.060	0.048	0.222	0.679	0.460	0.231	0.724	0.533

noteworthy, as shown in Table 1. As demonstrated by the study, distinct concentrations of growth hormone had a significant impact on shoot length. On the 30th day, the highest shoot length (2.12 cm) was achieved with T_6 (IBA 2000 ppm + NAA 2000 ppm), statistically comparable to T_5 (IBA 1000 ppm + NAA 1000 ppm) showing value 2.02 cm, followed by T_2 (IBA 2000 ppm) at 1.88 cm. Conversely, the lowest shoot length (1.17 cm) was observed with control. A consistent incremental trend in shoot length, similar to shoot diameter, was noted from day 30 to 90 DAP. Treatment T_6 (10.00 cm) exhibited a 1.47-fold increase in shoot length compared to the control (6.78 cm), whereas other treatments also demonstrated increased shoot length, albeit to a lesser extent than T_6. Additionally, (Siddiqui and Hussain 2007) observed that on increasing IBA concertation up to 4000 ppm leads to augmented shoot diameter. Similar results were also recorded by Singh and Rattanpal (2017). This might be due to the frequency at which the vascular bundles absorb water and nutrients is closely correlated with the increase in plant height and diameter. The greater rooting percentage in IBA-treated plants enables the plant to absorb more nutrients, increasing plant height and shoot diameter (Siddiqui and Hussain 2007 and Kasim *et al.* 2009).

Number of leaves

Significant impact was recorded on leaf count due to varying concentrations of growth hormones at different days of readings. Experiment showed that under T_6 highest number of leaves observed on 30th day which was more than double the number of leaves observed under control. Like shoot length and shoot diameter, number of leaves also increased with time period and maximum numbers was observed on day 90th. Among all the treatments studied T_6 recorded with maximum number of leaves (10.03) followed by T_5 and T_2 which recorded 8.76 and 7.68 number of leaves. While minimum number of leaves (6.00) were observed with control, as presented in Table 1. Interestingly, T_6 contained leaves 1.7 times higher than control. Singh *et al*. (2014) demonstrated that maximum number of leaves/cutting (7.67) was obtained in *Morus alba* when treated with IBA @ 2000 ppm. Singh and Rattanpal (2017) examined that combination of IBA and NAA gives maximum number of leaves in hardwood cuttings of *Ficus carica*. The rise in leaf count possibly results from robust rooting prompted by the growth regulator, facilitating increased nutrient absorption in cuttings and subsequently leading to increased leaf production.

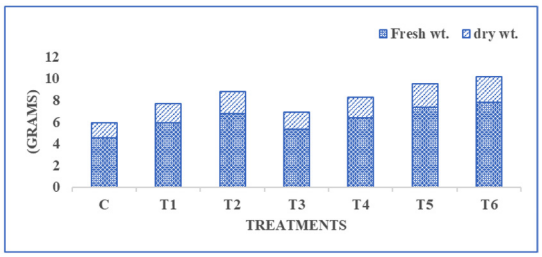

Fig. 2. Changes of the fresh and dry weight of shoots in hardwood cuttings of fig (*Ficus carica* L.) cv Dinkar at different treatments (Control -T_6).

Fresh weight and dry weight (g)

The data presented in the Fig. 2 pertaining to the fresh weight and dry weight of fig shoots cuttings, observed on 90th day of treatment, indicated a significant influence of growth hormone fresh and dry shoot weight. The maximum fresh shoot weight (6.89 g) was obtained in T_6, followed by T_5 and T_2 which was 6.71 g and 6.35 g, respectively. On the other hand, minimum fresh weight was documented in control. Fresh weight observed in T_6 was almost 1.72 times higher than control. Similarly, the highest dry weight of shoot (2.06 g) was observed with T_6 followed by T_5 and T_2 which showed 1.97 g and 1.90 g respectively. The minimum dry weight (1.34 g) was recorded with control. The results of our study are in line with the observations recorded by Ghosh *et al.* (2017) in Phalsa, the maximum fresh and dry shoot weight was observed when the cuttings were treated with IBA and NAA both. This result is explained by the fact that hardwood cuttings produce more shoots and leaves, as well as more leaf area, chlorophyll content, starch and total sugar levels, and a higher C/N ratio, all of which contribute to the highest fresh and dry shoot weights in Phalsa (Singh and Tomar 2015).

CONCLUSION

On the basis of present investigation, it can be concluded that combine application of IBA 2000 ppm + NAA 2000 ppm, significantly improve shoot performance of hardwood cuttings of Fig cv Dinkar. Which can boost the establishment profitable orchards of this multi nutritional fruit tree.

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