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Effect of IBA and Bio-Inoculants on Fig (*Ficus carica* L.) Hard Wood Cutting for Growth and Success

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ABSTRACT: An experiment entitled ''Effect of IBA and Bio-Inoculants on Fig (*Ficus carica* L.) Hard Wood Cutting for Growth and Success'' was carried out at Fruit Research Station, Imaliya, Department of Horticulture, JNKVV, Jabalpur between the period January 2022 to April 2022 in a Factorial Completely Randomized Design with three replications. The experiment was comprised of two factors - 5 levels of IBA *i.e.*, (C_1) IBA 0 ppm (Control), (C_2) IBA 500 ppm, (C_3) IBA 1000 ppm, (C_4) IBA 1500 ppm, (C_5) IBA 2000 ppm and Four types of growing media *i.e.*, (M_1) Normal soil, (M_2) Normal soil + PSB, (M_3) Normal soil + VAM and (M_4) Normal soil + PSB + VAM. The result revealed that among the various treatment combinations, the hard wood cuttings treated with 2000 ppm IBA and planted in growing media having Normal soil + PSB + VAM (C_5M_4) proved superior with respect to minimum days taken to start sprouting (11.17 days), maximum - number of sprouts/cutting (1.95 and 4.65), number of sprouted cutting/treatment (26.13 and 27.53) at 30 and 60 DAP., shoot length (4.54, 7.37 and 16.44 cm), shoot diameter (2.58, 4.94 and 6.47 mm), number of leaves (4.86, 8.28 and 10.43), length of leaves (4.75, 10.64 and 15.00 cm), width of leaves (4.70, 9.18 and 14.29 cm) at 30, 60 and 90 DAP, success percent of cutting (84.19 and 82.22 %)at 30 and 60 DAP, fresh weight of shoot (34.80 g), dry weight of shoot (25.40 g) at 90 DAP. leaf area index (9.54 & 20.16) at 60 and 90 DAP, leaf area duration (7142.84) at 90 DAP, leaf chlorophyll content index (54.73) at 90 DAP, light transmission ratio (55.13) at 90 DAP.

Keywords: Fig (*Ficus Carica*), IBA, PSB, VAM, growth, hard wood cutting.

INTRODUCTION

Fig (*Ficus carica* L.) is a deciduous and subtropical fruit tree that belongs to the Moraceae family and genus ficus. It is a large shrub or small tree with a short and twisted trunk with leaves deeply 3 to 5 lobed. It contains copious amounts of milky latex (Dahale *et al.*, 2018). It is said to be originated in the East Mediterranean region from where its cultivation expanded to the whole of the Mediterranean region. The genus *ficus* is a large one containing more than 1000 species, out of which about 65 species are found in India (Aghera and Makwana 2018). In 2018, world production of raw figs was about 1.14 million tons, led by Turkey (with 27% of the world total), Egypt, Morocco, and Algeria as the largest producers collectively accounting for 64% of the total fig production (FAO, 2018). The area under fig cultivation in India is about 5600 hectares with a production of about 13,802 thousand tons and an average productivity of 12.32 t/ha (NHB, 2018). Turkey is the main exporter of *Ficus carica* followed by Austria, Spain, Italy and the Netherlands. The main importing countries of fig are France, Germany, Austria and the United Kingdom (Agrifarming). In India, fig is mainly grown in Maharashtra, Gujarat, Uttar Pradesh, Karnataka Tamil Nadu and Madhya Pradesh. Uttarakhand, due to its varied eco-geographical and eco-climatic conditions is one such state which is highly enriched with its vegetation including wild edible fruits such as Wild Fig (Saklani and Chandra 2011). Fresh fig fruits are very delicious and nutritious which is poor source of vitamin C, but is rich in calories, protein, calcium, fiber and iron (Dahale *et al.*, 2018). The average composition of 100 g dried fig is 4 g protein, 69 g carbohydrate, 1 g fat, 200 mg calcium, 4 mg iron, 100 IU vitamin A, 0.1 g thiamine and 260 Kilo Calories of calorific value (Nale, 2021).

Fig is propagated by asexual means which is very useful for replicating true to type clonal planting material for multiplication of elite plants for plantation purpose, germplasm conservation and introduction of fast growing species. In comparison to other methods of asexual propagation in fig (Animove, 1972), fig are commercially propagated by hardwood stem cuttings in

India (Patel *et al*., 2017). Although fig can strike roots but rooting is not appreciable. Growth regulators are being used to improve its rooting ability. The ability of branch cutting to sprout and root is determined by various internal and external factors. These include the type of cuttings, seasons, concentration of endogenous and exogenous phytoharmones, physiological basis and various other internal bases (Arya *et al*., 1994). Indole-3-Butyric Acid is the synthetic plant hormone. This is active in inhibiting auxiliary bud break on developing shoots. It promotes cell elongation which helped to increase in root length. It is a leading plant hormone used to generate new roots in the cloning of plants through cuttings (Tanwar *et al.*, 2020).

Some reports available showed that highest growth percent, plant height, leaf area, shoot diameter, root number in hard wood cuttings of Fig was observed with 4000 ppm IBA treatment and the lowest in control treatment (Siddiqui and Hussain 2007). The application of IBA on cutting before transplanting increased the dry matter weight of shoots and roots in Fig cv. "Roxo de Valinhos (Chalfun *et al.,* 2003). Suitable medium for cutting establishment should have enough moisture and good aeration. Use of optimum rooting media and optimum concentration of IBA would help in rapid multiplication of fig cuttings under shade net conditions.

MATERIALS AND METHODS

Hard wood cuttings having 5-6 nodes were taken from one year old shoot. The length of cuttings used for planting was 15-20 cm and pencil thickness in diameter. The leaves were removed from the cuttings and were trimmed to the required length. The bottom cut is made round just below the node and the upper cut is made in a slanting 1-2 cm above the upper node. The potting mixtures were prepared with soil, sand and farmyard manure (1:1:1) and these were enriched with bioinoculants as per treatment. Polythene bags of 15 × 23 cm size of 200 gauge were used for filling potting mixture of soil, sand and farmyard manure in the ratio of 1:1:1, and mixed bio-inoculants (PSB and VAM) 5g/pot culture in potting mixture. The requisite quantity of Indol-3-butaric acid (IBA) 500, 1000, 1500 and 2000 mg was weighed separately and transferred to different volumetric flasks and then these weighed growth regulator samples were first dissolved in 10 ml of ethyl alcohol (90%) by thoroughly shaking, then measured quantity (990 ml) of distilled water was added into the flask. IBA solutions of 500, 1000, 1500 and 2000ppm was obtained.

The fresh basal end of cuttings about 3 cm were dipped in hormonal solutions of 500 ppm, 1000 ppm, 1500 ppm and 2000 ppm for 10 minute. After treatment of cuttings with different concentration of IBA, the cuttings were planted in the polybags containing potting mixture. The cuttings were planted in polythene bags and kept under net house condition.

RESULT AND DISCUSSION

There was a significant to effect of IBA levels and bio-inoculants on shoot parameters and physiological parameters.

Table 1: Treatments and their corresponding symbols used for current study.

Symbols	Treatments
	IBA Levels (A)
C_1	IBA 0 ppm (Control) + Normal soil
C_2	IBA 500 ppm
C_3	IBA 1000 ppm
C_4	IBA 1500 ppm
C_5	IBA 2000 ppm
	Growing media (B)
M_1	Normal soil
M_2	Normal soil + PSB
M_3	Normal soil + VAM
M_4	Normal soil + PSB + VAM
	Interaction (A × B)
C_1M_1	IBA 0 ppm (Control) + Normal soil
C_1M_2	IBA 0 ppm + Normal soil + PSB
C_1M_3	IBA 0 ppm + Normal soil + VAM
C_1M_4	IBA 0 ppm + Normal soil + PSB + VAM
C_2M_1	IBA 500 ppm + Normal soil
C_2M_2	IBA 500 ppm + Normal soil + PSB
C_2M_3	IBA 500 ppm + Normal soil + VAM
C_2M_4	IBA 500 ppm + Normal soil + PSB + VAM
C_3M1	IBA 1000 ppm + Normal soil
C_3M_2	IBA 1000 ppm + Normal soil + PSB
C_3M_3	IBA 1000 ppm + Normal soil + VAM
C_3M_4	IBA 1000 ppm + Normal soil + PSB + VAM
C_4M_1	IBA 1500 ppm + Normal soil
C_4M_2	IBA 1500 ppm + Normal soil + PSB
C_4M_3	IBA 1500 ppm + Normal soil + VAM
C_4M_4	IBA 1500 ppm + Normal soil + PSB + VAM
C_5M_1	IBA 2000 ppm + Normal soil
C_5M_2	IBA 2000 ppm + Normal soil + PSB
C_5M_3	IBA 2000 ppm + Normal soil + VAM
C_5M_4	IBA 2000 ppm + Normal soil + PSB + VAM

Effect of IBA levels and bio-inoculants on shoot parameters *viz*., Days taken to start sprouting, Number of sprouts/cutting, Number of sprouted cutting/treatment, Sprout length (cm), Sprout diameter (mm), Number of leaves, Length of leaves (cm), Width of leaves (cm), Fresh weight and dry weight of shoot (g) and success percent of cutting. The different IBA levels and bio-inoculants promote the shoot parameters were noted in the treatment combination of IBA 2000 ppm + Normal soil + PSB + VAM (C_5M_4) required a minimum days taken to start sprouting over all the other combinations. Bio-fertilizers increased level of growth promoting substance, available N_2, P_2O_5 and other nutrients with the application of PSB due to synergistic effect of biofertilizer in various ways (Damar *et al.*, 2014) and increase the concentration of IBA, which increased the level of auxins resulting in earlier completion of physiological processes in sprouting of cuttings (Tanwar *et al.*, 2020). The application of VAM +PSB +100% phosphorus recorded higher plant growth followed by VAM+PSB+50% phosphorus (Jain *et al.*, 1999). The increased number of sprouts might be due to better utilization of stored carbohydrates, nitrogen and other factors with the help of growth regulators and media (Sinha *et al.,* 2014). The results confirms the findings of Pirlak (2000) who obtained significant increase in number of sprouted cuttings in Cornelian Cherry cuttings with increasing IBA concentrations. Earliness in sprouting, increase in number of sprouts and sprout length might be due to better utilization of stored carbohydrates, nitrogen and other factors with the help of growth regulators (Swathi, 2013). These results are in line with the findings of Kaur (2016) in pomegranate cv. Ganesh and Khajehpour *et al.* (2014) in olive and Kishorbhai (2014) in fig. The increase in plant height and its diameter is directly related to the rate of uptake of water and nutrients by the vascular bundles. Due to higher rooting per cent in IBA treated plants help the plant to uptake more nutrients and hence increase in plant height and shoot diameter. It shows that the VAM fungi, which was efficient in improving in establishment, vegetative growth parameters. All vegetative characters like number of leaves, shoot length and leaf area were higher on inoculation with IBA treated and VAM. This enhancement of vegetative growth may be due to the well-developed, vigorous root system produced on inoculation with VAM fungi Earlier studies also support the enhancement of vegetative growth of black pepper by VAM fungi Thanuja (1999). Similar results have been reported by Kudmulwar *et al.* (2008); Richhariya (2012). The highest number of leaves is associated with number of sprouts as well as length of sprouts of cutting, which in turn, depends on hydrolysis of reserve food materials, proper shoot and root balance. The number of leaves is the most important growth character that has direct impact on total leaf area. The highest number of leaves were associated with number of sprouts as well as length of sprouts of cuttings, which in turn, was dependent on hydrolysis of reserve food materials, proper shoot and root balance Kaur and Kaur (2017).

The more number of leaves, length and number of shoots directly helps in increasing the fresh and dry weight of shoots (Tanwar *et al*., 2020). Auxins increased the permeability of cell for moisture, nutrients and resulted in the enlargement of cell causing more growth of plant parts. They increased the number of shoots resulting in higher fresh and dry weight of shoots. Similar results are confirmed by Kishorbhai (2014) in fig. The dry weight was related with number of sprouts, diameter and length of sprout per cutting. The findings of Thota *et al.* (2012) in lemon cuttings and Kishorbhai (2014) in fig are in support with the present investigation.

Effect of IBA levels and bio-inoculants on physiological parameters. Present investigation indicates that the different IBA levels and growing media promote the physiological parameters viz., Leaf Area index, Leaf Area duration, Leaf Chlorophyll content and Light transmission ratio. Among the physiological parameters the highest results were observed in (C_5) IBA 2000 ppm, in growing media (M_4) Normal soil + PSB + VAM individually and its combination of IBA 2000 ppm + Normal soil + PSB + VAM (C_5M_4) over rest of the other treatments. Leaf area influence the production of biomass in any crop and its relationship with biological yield as it is well established in crops (Welbank *et al*., 1966). LAI is an important character depends on leaf orientation. The vertically oriented leaves had a higher photosynthesis rate than those with horizontal leaves. Higher leaf area index also appears under PSB, this is due to the maximum length and width leaves as well as the maximum number of leaves (Mahale, 1999). The higher LAI during this period may be attributed to the optimum availability of sunshine hours and temperature which might have accelerated cell division and cell enlargement in leaves resulting in increased the leaf area and subsequently leaf area index (Jamil *et al*., 2006).

The LAI could be integrated over time to take into the account persistence to leaf area. This integral value was termed as LAD and was found to be closely related to DMP and yield. Welbank *et al*. (1966) found it to be increased with increase in daily radiation. The leaves remained open for a prolonged period remobilized it assimilates to the sink during senescence Gupta and Olugbemi (1978). Usually the LAD is closely correlated with yield because interception of solar radiation over longer period of time generally means more dry matter production. Photosynthesis is the main process that can harvest energy derived from the sun. Photosynthetic pigment like chlorophyll is responsible for absorbing and trapping light energy in the early steps of photosynthesis. Higher number of leaves results in more production of chlorophyll that ultimately leads to more amount of photosynthesis and hence, higher vegetative and sink yield. These findings are in agreement with the findings of (Bagoury *et al.*, 2010); Mahore (2014). Chlorophyll content was influenced by number of leaves and leaf area Ghani *et al.* (2019). The better use of resources can be supported by observations on LTR.

Table 2: Growth and Success Percentage Parameters.

Treatment	Days taken to start sprouting	Number of sprouts/cutting (At 30 & 60 DAP)		Number of sprouted cutting/ treatment (At 30 & 60 DAP)		Shoot length (cm) (At 30, 60 & 90 DAP)			Shoot diameter (mm) (At 30, 60 & 90 DAP)			Number of leaves (At 30, 60 & 90 DAP)			Length of leaves (cm) (At 30, 60 & 90 DAP)		
		30	60	30	60	30	60	90	30	60	90	30	60	90	30	60	90
IBA Levels (A)																	
c	19.67	1.50	2.61	21.06	21.95	2.69	4.03	12.31	2.03	2.33	3.20	2.64	3.73	5.03	1.79	2.94	7.21
IBA 500 ppm	17.42	1.60	2.82	22.56	23.27	3.24	4.86	13.35	2.13	2.84	3.43	2.95	3.94	5.56	1.98	4.18	9.33
IBA 1000 ppm	15.51	1.71	3.36	22.73	23.42	3.59	5.34	14.58	2.20	3.02	3.79	3.58	4.37	6.68	2.68	5.60	12.35
IBA 1500 ppm	14.42	1.72	3.87	23.87	24.47	3.90	5.79	15.93	2.27	3.48	4.36	4.11	5.53	8.04	3.88	8.44	13.03
IBA 2000 ppm	12.14	1.83	4.40	25.32	25.99	4.29	6.79	0.19	2.46	4.26	5.47	4.67	6.89	9.64	4.69	9.63	14.18
S. Em ±	0.10	0.02	0.05	0.07	0.15	0.02	0.8	0.53	0.01	0.06	0.14	0.03	0.14	0.13	0.07	0.11	0.21
CD at 5%	0.29	0.05	0.15	0.19	0.44	0.05	0.22	0.53	0.04	0.19	0.41	0.09	0.39	0.37	0.19	0.31	0.61
Growing media (B)																	
Normal soil	16.59	1.62	3.16	22.50	23.42	3.39	5.07	13.64	2.15	2.98	3.82	2.83	4.54	6.65	2.72	5.47	10.52
Normal soil + PSB	15.55	1.69	3.48	23.34	23.98	3.56	5.52	12.93	2.25	3.23	4.15	3.61	4.92	7.29	3.10	6.32	11.49
Normal soil + VAM	16.15	1.67	3.42	22.90	23.66	3.47	5.20	13.86	2.20	3.11	3.86	3.42	4.77	6.66	2.92	6.09	11.00
Normal soil + PSB + VAM	15.05	1.71	3.58	23.73	24.38	3.73	5.65	0.17	2.26	3.43	4.38	4.22	5.34	7.46	3.28	6.75	11.86
S. Em ±	0.9	0.02	0.5	0.06	0.14	0.01	0.07	0.48	0.01	0.06	0.13	0.16	0.12	0.11	0.06	0.10	0.19
CD at 5 %	0.26	0.05	0.13	0.17	0.39	0.04	0.20	0.48	0.03	0.17	0.37	0.45	0.35	0.33	0.17	0.27	0.54
Interaction (A × B)																	9.08
IBA 0 ppm (Control) + Normal soil	20.60	1.44	2.25	20.18	21.32	2.51	3.75	11.33	1.95	2.11	3.14	2.59	3.70	5.00	1.76	2.80	7.18
IBA 0 ppm + Normal soil + PSB	19.00	1.53	2.72	21.72	22.32	2.80	4.25	11.00	2.06	2.39	3.22	2.67	3.73	5.04	1.81	3.03	7.22
IBA 0 ppm + Normal soil + VAM	20.39	1.50	2.71	20.87	21.77	2.62	3.89	11.45	2.04	2.35	3.19	2.61	3.72	5.02	1.77	2.83	7.21
IBA 0 ppm + Normal soil + PSB + VAM	18.67	1.54	2.75	21.48	22.38	2.81	4.23	11.69	2.08	2.49	3.24	2.71	3.75	5.07	1.83	3.10	7.23
IBA 500 ppm + Normal soil	18.33	1.56	2.77	22.13	23.17	3.11	4.67	12.63	2.10	2.79	3.33	2.84	3.78	5.13	1.84	3.42	7.27
IBA 500 ppm + Normal soil + PSB	17.33	1.62	2.81	22.37	23.31	3.26	4.90	12.27	2.14	2.82	3.46	2.87	4.03	5.85	2.03	4.49	10.18
IBA 500 ppm + Normal soil + VAM	17.67	1.58	2.80	22.21	23.27	3.21	4.82	12.65	2.12	2.81	3.38	2.85	3.87	5.34	1.97	4.27	9.14
IBA 500 ppm + Normal soil + PSB + VAM	16.33	1.64	2.88	22.45	23.33	3.38	5.05	12.72	2.15	2.92	3.55	3.25	4.07	5.90	2.09	4.55	10.73
IBA 1000 ppm + Normal soil	16.00	1.65	3.03	22.51	23.26	3.39	5.09	13.32	2.16	2.93	3.72	3.35	4.10	6.37	2.13	4.77	11.90
IBA 1000 ppm + Normal soil + PSB	15.33	1.70	3.34	23.26	23.45	3.65	5.33	13.30	2.21	3.07	3.79	3.73	4.53	6.93	2.72	5.74	12.50
IBA 1000 ppm + Normal soil + VAM	15.67	1.69	3.33	22.93	23.37	3.53	5.30	14.06	2.19	2.95	3.73	3.42	4.23	5.94	2.44	5.43	12.00
IBA 1000 ppm + Normal soil + PSB + VAM	15.06	1.71	3.71	23.30	23.60	3.77	5.62	14.17	2.22	3.13	3.92	3.82	4.63	7.46	3.43	6.44	13.01
IBA 1500 ppm + Normal soil	15.00	1.72	3.81	23.53	24.13	3.78	5.67	14.59	2.25	3.19	4.25	3.97	4.83	7.50	3.47	7.28	12.83
IBA 1500 ppm + Normal soil + PSB	14.02	1.74	3.88	23.96	24.99	3.85	5.79	14.40	2.27	3.60	4.43	4.17	5.77	8.22	3.93	8.74	13.07
IBA 1500 ppm + Normal soil + VAM	14.67	1.73	3.86	23.64	24.54	3.81	5.71	15.16	2.26	3.47	4.32	4.03	5.57	7.99	3.83	8.70	12.88
IBA 1500 ppm + Normal soil + PSB + VAM	14.00	1.75	3.91	24.35	25.04	4.13	6.01	15.47	2.28	3.66	4.45	4.24	5.94	8.43	4.30	9.03	13.33
IBA 2000 ppm + Normal soil	13.00	1.76	3.94	24.43	25.10	4.17	6.19	16.19	2.30	3.85	4.64	4.43	6.28	8.73	4.40	9.07	13.43
IBA 2000 ppm + Normal soil + PSB	12.07	1.86	4.63	25.63	25.85	4.25	7.32	15.61	2.55	4.27	5.83	4.75	6.53	10.39	5.02	9.57	14.50
IBA 2000 ppm + Normal soil + VAM	12.33	1.82	4.39	25.09	25.48	4.18	6.27	16.44	2.41	3.98	4.67	4.63	6.47	9.00	4.57	9.22	13.78
IBA 2000 ppm + Normal soil + PSB + VAM	11.17	1.95	4.65	26.13	27.53	4.54	7.37	0.37	2.58	4.94	6.71	4.86	8.28	10.43	4.75	10.64	15.00
S. Em ±	0.20	0.04	0.10	0.13	0.30	0.03	0.15	1.07	0.03	0.13	0.29	0.06	0.27	0.26	0.13	0.22	0.42
CD at 5 %	0.57	0.10	0.30	0.38	0.87	0.09	0.44	1.07	0.08	0.37	0.82	0.18	0.78	0.73	0.38	0.61	1.20

Table 3: Growth and success percent parameters.

Treatment	Width of leaves (cm) (At 30, 60 & 90 DAP)			Fresh weight of shoot (g) At 90 DAP	Dry weight of shoot (g) At 90 DAP	Success percent of cutting (At 30 & 60 DAP)	
	30	60	90			30	60
IBA Levels (A)							
IBA 0ppm (control) + Normal soil	1.74	1.98	4.91	27.96	17.43	68.50	62.06
IBA 500 ppm	1.92	2.34	8.40	30.98	19.54	72.10	67.42
IBA 1000 ppm	2.64	4.12	11.30	32.00	21.16	76.30	73.62
IBA 1500 ppm	3.81	7.14	12.08	32.48	22.69	78.37	77.53
IBA 2000 ppm	4.61	8.45	13.74	33.78	24.43	81.53	79.70
S. Em ±	0.06	0.09	0.11	0.26	0.37	0.52	0.49
CD at 5%	0.18	0.26	0.32	0.75	1.06	1.47	1.41
Growing media (B)							
Normal soil	2.66	4.29	9.16	30.42	19.85	73.36	70.03
Normal soil + PSB	3.04	4.94	9.52	31.71	21.51	76.09	72.80
Normal soil + VAM	2.87	4.74	10.68	31.41	20.91	75.06	71.17
Normal soil + PSB + VAM	3.22	5.26	10.98	32.21	21.94	76.93	74.27
S. Em ±	0.06	0.08	0.10	0.23	0.33	0.73	0.44
CD at 5 %	0.16	0.23	0.29	0.67	0.95	2.08	1.26
Interaction (A × B)							
IBA 0 ppm (Control) + Normal soil	1.70	1.86	3.45	24.23	14.30	63.80	59.56
IBA 0 ppm + Normal soil + PSB	1.77	2.00	3.75	29.07	18.83	70.08	60.85
IBA 0 ppm + Normal soil + VAM	1.71	1.91	6.17	28.47	17.50	70.00	63.63
IBA 0 ppm + Normal soil + PSB + VAM	1.79	2.15	6.29	30.07	19.07	70.12	64.22
IBA 500 ppm + Normal soil	1.80	2.20	6.71	30.67	19.12	70.17	64.66
IBA 500 ppm + Normal soil + PSB	1.98	2.43	6.38	31.12	19.53	72.22	69.67
IBA 500 ppm + Normal soil + VAM	1.91	2.23	10.25	31.00	19.50	71.11	65.33
IBA 500 ppm + Normal soil + PSB + VAM	2.00	2.52	10.25	31.15	20.02	74.89	70.00
IBA 1000 ppm + Normal soil	2.08	3.90	10.96	31.78	20.17	75.55	70.63
IBA 1000 ppm + Normal soil + PSB	2.69	4.14	11.23	32.10	21.50	76.66	76.63
IBA 1000 ppm + Normal soil + VAM	2.41	4.00	11.12	31.87	20.97	75.94	70.67
IBA 1000 ppm + Normal soil + PSB + VAM	3.38	4.44	11.88	32.23	22.02	77.04	76.55
IBA 1500 ppm + Normal soil	3.41	5.35	12.00	32.27	22.10	78.33	76.66
IBA 1500 ppm + Normal soil + PSB	3.85	7.85	12.08	32.43	23.10	78.38	77.77
IBA 1500 ppm + Normal soil + VAM	3.78	7.35	12.03	32.40	22.37	78.35	77.34
IBA 1500 ppm + Normal soil + PSB + VAM	4.21	8.03	12.20	32.42	23.20	78.41	78.33
IBA 2000 ppm + Normal soil	4.31	8.14	12.70	31.16	23.53	78.91	78.63
IBA 2000 ppm + Normal soil + PSB	4.91	8.30	14.13	33.81	24.57	83.10	79.07
IBA 2000 ppm + Normal soil + VAM	4.51	8.19	13.85	33.33	24.20	79.92	78.88
IBA 2000 ppm + Normal soil + PSB + VAM	4.70	9.18	14.29	34.80	25.40	84.19	82.22
S. Em ±	0.13	0.18	0.22	0.52	0.74	1.03	0.98
CD at 5 %	0.37	0.51	0.64	1.50	2.12	2.95	2.81

Physiological parameters

Treatment	Leaf area index		Leaf area duration (At 90 DAP)	Chlorophyll content index (At90 DAP)	Light transmission ratio (At 90 DAP)
	(At 60 DAP)	(at 90 DAP)			
IBA Levels (A)					
IBA 0 ppm (Control) + Normal soil	2.45	10.30	3302.79	46.88	46.56
IBA 500 ppm	2.72	11.11	4196.12	49.87	51.06
IBA 1000 ppm	3.62	12.43	4645.90	50.89	52.51
IBA 1500 ppm	4.85	14.73	4986.49	52.26	53.77
IBA 2000 ppm	6.47	17.40	5894.19	53.59	54.58
S. Em ±	0.12	0.08	55.23	0.47	0.58
CD at 5%	0.33	0.23	157.85	1.35	1.66
Growing media (B)					
Normal soil	3.52	12.51	4304.83	48.91	50.14
Normal soil + PSB	4.24	13.31	4704.09	51.28	52.18
Normal soil + VAM	3.75	13.20	4463.35	51.02	51.66
Normal soil + PSB + VAM	4.58	13.75	4948.44	51.59	52.80
S. Em ±	0.10	0.07	49.40	0.42	0.52
CD at 5 %	0.30	0.21	141.19	1.21	1.49
Interaction (A × B)					
IBA 0 ppm (Control) + Normal soil	2.23	10.11	3129.46	40.13	40.39
IBA 0 ppm + Normal soil + PSB	2.54	10.45	3367.93	49.13	48.68
IBA 0 ppm + Normal soil + VAM	2.48	10.16	3296.44	48.74	46.53
IBA 0 ppm + Normal soil + PSB + VAM	2.55	10.46	3417.34	49.49	50.25
IBA 500 ppm + Normal soil	2.57	10.52	3884.25	49.73	50.52
IBA 500 ppm + Normal soil + PSB	2.74	11.21	4365.38	49.93	51.27
IBA 500 ppm + Normal soil + VAM	2.63	11.19	4181.30	49.83	50.77
IBA 500 ppm + Normal soil + PSB + VAM	2.94	11.52	4355.14	50.00	51.67
IBA 1000 ppm + Normal soil	3.09	12.00	4540.88	50.17	52.13
IBA 1000 ppm + Normal soil + PSB	3.89	12.51	4701.57	51.13	52.67
IBA 1000 ppm + Normal soil + VAM	3.37	12.42	4614.84	51.10	52.53
IBA 1000 ppm + Normal soil + PSB + VAM	4.14	12.79	4726.31	51.17	52.70
IBA 1500 ppm + Normal soil	4.25	13.60	4859.44	51.93	53.31
IBA 1500 ppm + Normal soil + PSB	5.37	14.79	5049.72	52.33	53.81
IBA 1500 ppm + Normal soil + VAM	4.35	14.65	4936.28	52.23	53.70
IBA 1500 ppm + Normal soil + PSB + VAM	5.42	15.87	5100.50	52.53	54.23
IBA 2000 ppm + Normal soil	5.44	16.33	5110.11	52.57	54.36
IBA 2000 ppm + Normal soil + PSB	6.66	17.60	6035.87	53.87	54.45
IBA 2000 ppm + Normal soil + VAM	5.93	17.58	5287.88	53.20	54.38
IBA 2000 ppm + Normal soil + PSB + VAM	7.84	18.07	7142.92	54.73	55.13
S. Em ±	0.23	0.26	110.45	1.45	1.16
CD at 5 %	0.66	0.47	315.71	4.14	3.32

The higher light interception was due to quick and good vegetative cover, which helps in better interception of light (Dhandayuthapani and Latha 2015). These are in agreement with the findings of (Mahore, 2014), who also revealed that denser canopy and more leaf area index results in less LTR.

CONCLUSIONS

Based on the findings of the present investigation, it is concluded that the IBA level IBA 2000 ppm (C_5) proved best over the other IBA levels which significantly improved the growth and success of Fig Hard wood cutting. Among the bio-inoculants enriched growing media, the media containing Normal soil + PSB + VAM(M_4) significantly performed better over the other bio-inoculants enriched growing media by improving the growth and success of Fig Hard wood cuttings. Among the different treatment combinations, IBA 2000 ppm + Normal soil + PSB + VAM (C_5M_4) showed superiority over rest of the treatment combinations with respect to growth and success of Fig hard wood cuttings.

FUTURE SCOPE

Further research work must be repeated for two or three years for confirmation the results. Some other new Bio-inoculants and Plant Growth Regulators may be tried for further studies. Varying dipping time and Concentrations/ levels of PGR and Bio-inoculants may be tried for further studies.

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Conflict of Interest. None.

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