Original Research Article

EFFECT OF IBA AND ROOTING MEDIA ON AIR LAYERING IN KINNOW (CITRUS SPP)

Abstract

The present investigation entitled "EFFECT OF IBA AND ROOTING MEDIA ON AIR LAYERING IN KINNOW (CITRUS SPP)" was carried out in the department of Horticulture, Prayagraj, Naini Agriculture Institute, Sam Higginbottom Institute of Agriculture, Technology and sciences, Prayagraj in the year 2023-2024.The goal of the experiment was to determine the best treatment combination for increasing farmer profitability and yield. A Factorial Randomized Complete Block Design including three replications and twelve treatment combinations was used to set up the experiment. The treatments consist of variousConcentration of IBA with rooting media (Cocopeat,vermicompost,soil). Result obtainedin present investigation showed that thetreatmentT8(Soil+Cocopeat+IBA@1000ppm) was determined to have the finest growth features, including Success percentage (91.67), Survival percentage(66), Number of days to root formation(initial rooting)(27.67),No of days to complete rooting(46.33),Root length(5.43),Root thickness(3.03),No of roots per layer(13.10),No of new sprouts in a layer per month(6.00,11.67,10.33,6.33),Number of new leavesin a layer per month (7.67,11.33,12.6,13.6) and Length of new shoot in a layer per month (7.67,11.33,12.6,13.6).

Keywords:IBA, Rooting media(Soil,Cocopeat,Vermicompost) Kinnow

Introduction

Citrus is an important sub-tropical fruit tree belongs to family Rutaceae and believed to have originated in China. Citrus has played a great role in the food and nutritional security and it can bring economic prosperity in the areas where it is grown.

It is the one of the most important fruit crops since antique and known as a good source of vitamin-C with high antioxidant potential. It is a most valuable crop which is adaptable to wide range of soils, province, planting and cultural arrangements and over more than 100 nations recorded citrus production in 1980 (Reitz, 1984) . India is the third largest citrus producing country in the world with an area of 1.02 m ha and annual production of 11.15 m tonnes (FAOSTAT 2015) Kinnow is a high yielding Mandarin hybrid, cultivated extensively in the Punjab region of India.

It is a hybrid of two Citrus cultivar King (Citrus nobilis) x 'Willow Leaf' (Citrus delicosa) which developed by H. B. Frost. It contains 2% Vitamin A, 110% Vitamin C, 2% Iron and 4% Calcium. The cultivation of Kinnow in India for a long time and extends too many states of the country.In plants, where vegetative propagation is not easy. Bioinoculants can help in callus formation, root initiation, root development and survival percentage of air layers.

Kinnow / Mandarin fruits comprise a high amount of juice content, making them ideal for extracting juice and pulp.

Mandarin fruit the amount of juice may vary from 45 to 60%. The fruits could be used for a variety of purposes ranging from fresh juice to candy, jellies and wine. Kinnow / Mandarin peel and pulp are the major by-products of the Kinnow / Mandarin juice processing industry, which accounts for 55-60% of the fresh fruit weight, whereas around 30% of the produce of citrus fruits is processed to make juice. The remaining waste of Kinnow / Mandarin fruit after juice extraction could also be useful as animal feed.

Kinnow fruit seeds are planted between August and October. Harvesting starts when the fruit's external colour becomes orange, from December to February. The best harvesting time is mid-January to mid-February, when the fruit attains a TSS/acid ratio of 12:1 to 14:1. The fruit quality declines in later pickings. Fruits are harvested by clipping the stem with the help of sharp clippers (secateurs). The stem is cut as short as possible to avoid mechanical injury to the fruit in packing and transits. As it is a comparatively loose rind fruit, harvesting by pulling fruits with one's hands is avoided. Coating kinnow fruits with commercial waxes can increase the shelf life up to 60 days. The fruit can be stored in cold storage at a temperature of 4-5 °C and a relative humidity of 85-90%.

Soil plays a crucial role in the success of air layering, a propagation method used to grow new plants. The right type of soil can provide the necessary nutrients, moisture, and aeration for the development of roots on the air-layered stem. Here are some key effects of soil on air layering.

1. Moisture Retention: The soil used for air layering should have good moisture retention properties. It should be able to hold water without becoming waterlogged, as excessive moisture can lead to rotting of the stem. A well-draining soil mix that retains moisture without becoming soggy is ideal

2. Nutrient Availability: The soil should contain essential nutrients that promote root growth. A balanced soil mix with organic .matter can provide the necessary nutrients for the development of roots on the air-layered stem.

3. Aeration: Proper aeration is essential for root development during air layering. The soil should be well-aerated to allow oxygen to reach the developing roots. A loose, well-draining soil mix can provide the necessary aeration for healthy root growth.

4. Sterility: Using sterile soil or a soilless mix can help prevent the growth of pathogens and diseases that can affect the success of air layering. Sterile soil reduces the risk of contamination and promotes a clean environment for root development.

5. Consistency: Consistent soil moisture levels are important for successful air layering. The soil should be kept consistently moist but not waterlogged to promote healthy root growth. Monitoring and adjusting the moisture levels in the soil can help ensure the success of air lAsexual propagation methods include budding, grafting and air-layering. Asexual propagation methods can probably be the most widely used commercial method of propagation in Kinnow.

Synthetic hormones like IBA are commonly used to promote root development in asexual propagation. IBA is widely used as a root-initiation promoter in agriculture. IBA is a suitable

auxin for this type of experiment because it shows a large amount of flexibility when dealing with the range of concentration that can be used.

Vermicompost also has hormone-like activity and is rich in humic acid, leading to an increase in root biomass. Overall, this research resulted in better performance of the calamansi air layers root parameters using vermicompost, so the researcher recommends using vermicompost as organic media for air layering.

Cocopeat can be used as a rooting medium in air layering to help promote root growth. It has good water retention properties, which can help keep the air layering site moist and provide a suitable environment for roots to develop. Additionally, cocopeat is lightweight and porous, allowing for good aeration around the stem cutting, which is important for root development. Overall, using cocopeat in air layering can improve the success rate of root formation and help ensure healthy and robust roots in the propagated plant.ayering.

Materials and Methods

From August 19, 2023, to February 1, 2024, field experiments were conducted at the Central Research Field, Naini Agricultural Institute, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj (25.43° N latitude, 81.84° E longitude) in India to investigate the Effect of IBA and rooting media on air layering in kinnow (Citrus spp). The area has both loam and sandy loam soil. With a subtropical climate, the Prayagraj district experiences typical maximum temperatures of 43°C to 47°C, with the possibility of reaching 48°C during the hottest summer months. Factorial Randomized Complete Block Design was used to set up the experiment, and twelve treatments were reproduced three times. The twelve treatments consist of T1(SOIL + IBA1500ppm) T2, (SOIL + IBA1000ppm) T3(COCOPEAT + IBA1500ppm), T4(COCOPEAT +IBA1000ppm),T5(VERMICOMPOST + IBA1500ppm),T6(VERMICOMPOST + IBA1000ppm),T7 (SOIL + COCOPEAT +IBA1500ppm),T8(SOIL + COCOPEAT + IBA1000ppm), T9(SOIL + VERMICOMPOST +IBA1500ppm),T10(SOIL + VERMICOMPOST+ IBA1000ppm),T11(COCOPEAT +VERMICOMPOST +IBA1500ppm),T12(COCOPEAT + VERMICOMPOST +IBA1000ppm)All the doses of IBA combination were applied at the time of air layering and during Root parameters(Success in rooting percentage, Number of days for root formation(Initial rootin),Days to complete rooting, Root thickness(mm), Root length(cm),Number of roots per layer), Shoot parameters (No of re-sprouts per plant (1MAP,2MAP,3MAP,4MAP), Length of new shoot (1MAP,2MAP,3MAP,4MAP),Number of new leaves(1MAP,2MAP,3MAP,4MAP), and Survival percentage were recorded.The statistical procedure for agricultural research states that an analysis of variance will be performed on the data's mean values.Randomized Block Design. A method and algorithms were used to compute different statistical parameters. The Analysis of Variance (ANNOVA) method was used to compare the means of the attributes[8].

List 1. Treatment Details

Treatment	Treatment Details
T1	SOIL + IBA1500ppm
T2	SOIL + IBA1000ppm
T3	COCOPEAT + IBA1500ppm
T4	COCOPEAT +IBA1000ppm

T5	VERMICOMPOST + IBA1500ppm
T6	VERMICOMPOST + IBA1000ppm
T7	SOIL + COCOPEAT +IBA1500ppm
T8	SOIL + COCOPEAT + IBA1000ppm
T9	SOIL + VERMICOMPOST +IBA1500ppm
T10	SOIL + VERMICOMPOST+ IBA1000ppm
T11	COCOPEAT +VERMICOMPOST +IBA1500ppm
T12	COCOPEAT + VERMICOMPOST +IBA1000ppm

Factor:

The successfully rooted air layers were transplanted in polybags under nursery conditions and three sprouted plants were selected randomly from each treatment in each replication. These three plants were labeled for recording the observations throughout the study.

3.7.1 Root Parameters

3.7.1.1 Success in rooting percentage:

The number of rooted air-layers was counted after detachment of air layered twigs from the mother plants. The data were compiled and success in rooting percentage was calculated by the following formula:

Number of rooted air layers

Total no, of layers X 100

3.7.1.2 Number of days to root formation (initial rooting)

Observations were recorded for the number of days taken for the formation of first adventitious root(s) from the day of layering to the day of visibility of first root inside the polywraped layering.

3.7.1.3 Days to complete rooting

Observations were recorded for the number of days taken to complete full root development on air layered stems ie, from the day of layering to the day of detachment from the mother plant.

3.7.1.4 Root length (cm)

The observations were recorded with the help of scale at time when detachment of air layered stems from the mother plant. The length of primary root was measured from base up to tip.

3.7.1.5 Root thickness (mm)

The observations were recorded with the help of vernier calipers at the time when detachment of air layered stems from the mother plant. The diameter of root was measured from center of root.

3.7.1.6 Number of roots per layering

The observations were recorded by counting the number of adventitious roots formed at the time of detachment of layering from the mother plant

3.7.2 Shoot Parameters

3.7.2.1 Number of new sprouts per layer (IMAP, 2MAP, 3MAP, 4MAP)

Numbers of new sprouts were counted at 30, 60, 90 & 120 days intervals after planting of air layers into polybags by taking three random samples from each treatment under each replication.

3.7.2.2 Number of new leaves (IMAP, 2MAP, 3MAP, 4MAP)

Numbers of new leaves were counted at 30, 60, 90 & 120 days intervals after planting of air layers into polybags by taking three random samples from each treatment under each replication.

3.7.2.3 Length of new shoots (cm) (IMAP, 2MAP, 3MAP, 4MAP)

Length of new leaves were measured by using a scale at 30, 60, 90 & 120 days intervals after planting of air layers into polybags by taking three random samples from each treatment under each replication.

3.8 Plant survival percentage (%)

After transplantation in polybags survival percentage was calculated by using the following formula:

Number of survived plants X 100

Total no. of transplanted layers

3.9 Statistical analysis of experiment data

The data collected on different parameters were subjected to statistical analysis of variance technique as described by Panse and Sukhatme (1967). The method of "Analysis of Variance" for Completely Randomized Design was used and treatment effects of all the characters were studied by employing 'F' test. Five percent level of significance was used to test the "null hypothesis "for significance of results. The critical difference was calculated where the difference among the treatments was found significant by 'F' test. The C.V. percent was also worked out.

Result and Discussion

Effect of treatment T8 (SOIL + COCOPEAT + IBA @1000ppm) recorded the minimum number of days for root formation (initial rooting) [27.67days] over all other treatments where-as Treatment T10(SOIL + VERMICOMPOST +IBA @1000ppm) was found to be maximum number of days [40.03days].[TABLE-1]

Table 1:Number of days to root formation (initial rooting) as affected by various treatments inkinnow

TREATMENT	TREATMENT COMBINATION	SUCCESS % IN KINNOW
T1	SOIL + IBA @1500 PPM	31.00
T2	SOIL + IBA @1000 PPM	37.07

T3	**COCOPEAT + IBA @1500 PPM**	**31.23**
T4	**COCOPEAT + IBA @1000 PPM**	**30.33**
T5	**VERMICOMPOST + IBA @1500 PPM**	**34.33**
T6	**VERMICOMPOST + IBA @1000 PPM**	**31.13**
T7	**SOIL + COCOPEAT + IBA @1500 PPM**	**32.33**
T8	**SOIL + COCOPEAT + IBA @1000 PPM**	**27.67**
T9	**SOIL + VERMICOMPOST + IBA @1500 PPM**	**36.43**
T10	**SOIL + VERMICOMPOST + IBA @1000 PPM**	**40.03**
T11	**COCOPEAT + VERMICOMPOST + IBA @1500 PPM**	**35.63**
T12	**COCOPEAT + VERMICOMPOST + IBA @1000 PPM**	**34.67**
	F-TEST	**S**
	S.E.(m)	**0.53**
	C D (5%)	**1.56**
	CV	**2.75**

Effect of treatment T7 (SOIL +COCOPEAT+ IBA @1500ppm) recorded the minimum number of days to complete rooting [44.67 days] over all other treatments where-as Treatment T5 (VERMICOMPOST +IBA @1500ppm) was found non-significantly maximum number of days to complete rooting [60.33days]. It was also found that Treatment T8 (SOIL+COCOPEAT+IBA@1000PPM)[46.33days]was at par with treatment T10(SOIL+VERMICOMPOST+IBA @1000 PPM) [53.43days] during the period of study.[TABLE-2]

Table 2:Number of days to complete rooting as affected by various treatments in Kinnow

TREATMENT	TREATMENT COMBINATION	SUCCESS % IN KINNOW
T1	**SOIL + IBA @1500 PPM**	**55.27**
T2	**SOIL + IBA @1000 PPM**	**46.50**
T3	**COCOPEAT + IBA @1500 PPM**	**55.60**

T4	**COCOPEAT + IBA @1000 PPM**	**59.57**
T5	**VERMICOMPOST + IBA @1500 PPM**	**60.33**
T6	**VERMICOMPOST + IBA @1000 PPM**	**57.30**
T7	**SOIL + COCOPEAT + IBA @1500 PPM**	**44.67**
T8	**SOIL + COCOPEAT + IBA @1000 PPM**	**46.33**
T9	**SOIL + VERMICOMPOST + IBA @1500 PPM**	**53.73**
T10	**SOIL + VERMICOMPOST + IBA @1000 PPM**	**53.43**
T11	**COCOPEAT + VERMICOMPOST + IBA @1500 PPM**	**52.47**
T12	**COCOPEAT + VERMICOMPOST + IBA @1000 PPM**	**58.60**
	F-TEST	**S**
	S.E.(m)	**1.03**
	C D (5%)	**3.03**
	CV	**3.34**

Effect of treatment T8 (SOIL + COCOPEAT + IBA @1000ppm) recorded the longest root length [5.43cm] over all other treatments where-as Treatment T10 (SOIL+VRMICOMPOST+IBA @1000PPM) was found significantly shortest root length [3.10cm].[TABLE-3]

Table 3:Root length of layers as affected by various treatments in Kinnow

TREATMENT	TREATMENT COMBINATION	SUCCESS % IN KINNOW
T1	**SOIL + IBA @1500 PPM**	**4.20**
T2	**SOIL + IBA @1000 PPM**	**3.17**
T3	**COCOPEAT + IBA @1500 PPM**	**3.57**
T4	**COCOPEAT + IBA @1000 PPM**	**3.27**

T5	**VERMICOMPOST + IBA @1500 PPM**	**3.43**
T6	**VERMICOMPOST + IBA @1000 PPM**	**4.43**
T7	**SOIL + COCOPEAT + IBA @1500 PPM**	**4.23**
T8	**SOIL + COCOPEAT + IBA @1000 PPM**	**5.43**
T9	**SOIL + VERMICOMPOST + IBA @1500 PPM**	**3.97**
T10	**SOIL + VERMICOMPOST + IBA @1000 PPM**	**3.10**
T11	**COCOPEAT + VERMICOMPOST + IBA @1500 PPM**	**4.53**
T12	**COCOPEAT + VERMICOMPOST + IBA @1000 PPM**	**4.20**
	F-TEST	**S**
	S.E.(m)	**0.27**
	C D (5%)	**0.78**
	CV	**11.65**

Effect of treatment T8 (SOIL + COCOPEAT + IBA @1000ppm) recorded the maximum thickness [3.03mm] over all other treatments where-as Treatment T10(SOIL+VERMICOMPST+IBA @1000PPM)) was found significantly minimum root thickness [1.13mm]. [TABLE-4]

Table 4:Root thickness of layers as affected by various treatments in Kinnow

TREATMENT	TREATMENT COMBINATION	SUCCESS % IN KINNOW
T1	**SOIL + IBA @1500 PPM**	1.43
T2	**SOIL + IBA @1000 PPM**	1.27
T3	**COCOPEAT + IBA @1500 PPM**	1.87
T4	**COCOPEAT + IBA @1000 PPM**	2.27
T5	**VERMICOMPOST + IBA @1500 PPM**	2.03
T6	**VERMICOMPOST + IBA @1000 PPM**	1.60
T7	**SOIL + COCOPEAT + IBA @1500 PPM**	2.37
T8	**SOIL + COCOPEAT + IBA @1000 PPM**	3.03
T9	**SOIL + VERMICOMPOST + IBA @1500 PPM**	2.50
T10	**SOIL + VERMICOMPOST + IBA @1000 PPM**	1.13
T11	**COCOPEAT + VERMICOMPOST + IBA @1500 PPM**	2.67
T12	**COCOPEAT + VERMICOMPOST + IBA @1000 PPM**	2.63
	F-TEST	**S**
	S.E.(m)	**0.10**
	C D (5%)	**0.29**
	CV	**8.38**

Effect of treatment T8 SOIL + COCOPEAT + IBA @1000ppm recorded the maximum number of roots [13.10] over all other treatments where-as Treatment T10 (SOIL+VERMICOMPOSR+IBA @1000PPM) was found significantly minimum no. of roots [6.17]. It was also found that Treatment T8 (SOIL + COCOPEAT + IBA @1000ppm) [13.10] was at par with treatment T1 (SOIL+IBA @1500 PPM) [10.90] during the whole period of study.[TABLE-5]

Table5:Number of roots per layer as affected by various treatments in Kinnow

TREATMENT	TREATMENT COMBINATION	SUCCESS % IN KINNOW
T1	**SOIL + IBA @1500 PPM**	10.90
T2	**SOIL + IBA @1000 PPM**	9.37
T3	**COCOPEAT + IBA @1500 PPM**	9.40
T4	**COCOPEAT + IBA @1000 PPM**	6.80
T5	**VERMICOMPOST + IBA @1500 PPM**	8.27
T6	**VERMICOMPOST + IBA @1000 PPM**	12.83
T7	**SOIL + COCOPEAT + IBA @1500 PPM**	12.50
T8	**SOIL + COCOPEAT + IBA @1000 PPM**	13.10
T9	**SOIL + VERMICOMPOST + IBA @1500 PPM**	12.60
T10	**SOIL + VERMICOMPOST + IBA @1000 PPM**	6.17
T11	**COCOPEAT + VERMICOMPOST + IBA @1500 PPM**	8.80
T12	**COCOPEAT + VERMICOMPOST + IBA @1000 PPM**	6.77
	F-TEST	**S**
	S.E.(m)	**0.84**
	C D (5%)	**2.47**
	CV	**14.90**

Effect of treatment T8 (SOIL + COCOPEAT + IBA @1000ppm) recorded highest survival rate [66.66%] over all other treatments where-as Treatment T10 (SOIL+VERMICOMPOST+IBA @1000 PPM) was found significantly lowest [30%].[TABLE-6]

Table 6:Survival percentage of layers as affected by various treatments in Kinnow

TREATMENT	TREATMENT COMBINATION	SUCCESS % IN KINNOW
T1	SOIL + IBA @1500 PPM	35
T2	SOIL + IBA @1000 PPM	40
T3	COCOPEAT + IBA @1500 PPM	46
T4	COCOPEAT + IBA @1000 PPM	47
T5	VERMICOMPOST + IBA @1500 PPM	36
T6	VERMICOMPOST + IBA @1000 PPM	50
T7	SOIL + COCOPEAT + IBA @1500 PPM	38
T8	SOIL + COCOPEAT + IBA @1000 PPM	66
T9	SOIL + VERMICOMPOST + IBA @1500 PPM	50
T10	SOIL + VERMICOMPOST + IBA @1000 PPM	30
T11	COCOPEAT + VERMICOMPOST + IBA @1500 PPM	60
T12	COCOPEAT + VERMICOMPOST + IBA @1000 PPM	53
	F-TEST	S
	S.E.(m)	6.65
	C D (5%)	19.50
	CV	21.59

Effect of treatment T8SOIL + COCOPEAT + IBA @1000ppm recorded the maximum number of new sprouts [6.00(1MAP), 11.67(2MAP), 10.33(3MAP), 6.33(4MAP)] over all other treatments where-as Treatment T10 (SOIL+VERMICOMPOST+IBA @1000PPM) [2.67(1MAP), 6.33(2MAP), 5.67(3MAP), 2.67(4MAP)] was found significantly minimum number of new sprouts.[TABLE-7]

Table 7:Number of new sprouts in a layer per month as affected by various treatments in Kinnow

TREATMENT	No of new sprouts in kinnow			
	1MAP	2MAP	3MAP	4MAP
T1	**3.00**	**8.00**	**9.00**	**5.00**
T2	**3.33**	**7.67**	**7.33**	**4.00**
T3	**3.00**	**6.67**	**8.33**	**5.00**
T4	**5.33**	**7.33**	**8.67**	**4.00**
T5	**2.00**	**7.33**	**6.67**	**5.33**
T6	**3.33**	**9.33**	**7.00**	**4.00**
T7	**3.67**	**7.33**	**7.33**	**4.67**
T8	**6.00**	**11.67**	**10.33**	**6.33**
T9	**4.67**	**7.67**	**7.67**	**4.00**
T10	**2.67**	**6.33**	**5.67**	**2.67**
T11	**3.00**	**9.33**	**7.33**	**4.00**
T12	**2.33**	**7.00**	**8.00**	**5.33**
F-TEST	**S**	**S**	**S**	**S**
S.E.(m)	**0.61**	**0.83**	**0.79**	**0.51**
C D (5%)	**1.78**	**2.42**	**2.31**	**1.49**
CV	**29.88**	**17.93**	**17.54**	**19.39**

Effect of treatment T8 SOIL + COCOPEAT + IBA @1000ppm) recorded the maximum number of leaves [7.67(1MAP), 11.33(2MAP), 12.6(3MAP), 13.6(4MAP)] over all other treatments where-as Treatment T10 (SOIL+VERMICOMPOST+IBA @1000 PPM) was found significantly minimum number leaves [2.67(1MAP), 4.67(2MAP), 5.3(3MAP), 6.6(4MAP)].[TABLE-8]

Table 8: Number of new leaves in a layer per month as affected by various treatments in Kinnow

TREATMENT	No of new leaves in kinnow			
	1MAP	2MAP	3MAP	4MAP
T1	**3.33**	**7.67**	**10**	**12.3**
T2	**4.33**	**8.00**	**9.6**	**10.3**
T3	**6.00**	**5.67**	**8**	**7**
T4	**5.67**	**7.67**	**6**	**7.6**
T5	**6.67**	**5.67**	**5**	**6.3**
T6	**5.67**	**9.00**	**7.3**	**9**
T7	**5.67**	**8.00**	**7**	**11**
T8	**7.67**	**11.33**	**12.6**	**13.6**
T9	**5.00**	**6.00**	**6.6**	**7.6**
T10	**2.67**	**4.67**	**5.3**	**6.6**
T11	**5.33**	**8.33**	**7.3**	**9**
T12	**6.00**	**9.00**	**9**	**9.6**
F-TEST	**S**	**S**	**S**	**S**
S.E.(m)	**0.73**	**0.83**	**1.14**	**0.91**
C D (5%)	**2.13**	**2.43**	**3.36**	**2.66**
CV	**23.59**	**18.89**	**25.31**	**17.11**

Effect of treatment T8 (SOIL + COCOPEAT + IBA @1000ppm) recorded the longest length of shoots [5.21MAP), 6.2(2MAP), 7.1(3MAP), 10.6(4MAP)] over all other treatments where-as Treatment T10 (SOIL+VERMICOMPOST+IBA @1000 PPM) was found significantly shortest length of shoots [3.5(1MAP), 3.4(2MAP), 3.5(3MAP), 6.4(4MAP)].[TABLE-9]

Table 9: Length of new shoots in a layer per month as affected by various treatments in Kinnow

TREATMENT	Length of new shoots in kinnow			
	1MAP	2MAP	3MAP	4MAP
T1	**3.33**	**7.67**	**10**	**12.3**
T2	**4.33**	**8.00**	**9.6**	**10.3**
T3	**6.00**	**5.67**	**8**	**7**
T4	**5.67**	**7.67**	**6**	**7.6**
T5	**6.67**	**5.67**	**5**	**6.3**
T6	**5.67**	**9.00**	**7.3**	**9**

T7	**5.67**	**8.00**	**7**	**11**
T8	**7.67**	**11.33**	**12.6**	**13.6**
T9	**5.00**	**6.00**	**6.6**	**7.6**
T10	**2.67**	**4.67**	**5.3**	**6.6**
T11	**5.33**	**8.33**	**7.3**	**9**
T12	**6.00**	**9.00**	**9**	**9.6**
F-TEST	**S**	**S**	**S**	**S**
S.E.(m)	**0.31**	**0.43**	**0.60**	**0.57**
C D (5%)	**0.91**	**1.26**	**1.76**	**1.67**
CV	**13.46**	**15.83**	**17.30**	**11.97**

Conclusion

From the present investigation it is concluded that effect of Treatment T8 i.e., SOIL + COCOPEAT + IBA1000ppm was found to be best in terms of Number of days to root formation (initial rooting), Root length(cm), Root thickness(mm), Number of roots per layer, Survival percentage, Number of new sprouts per layered plant, Number of new leaves per layered plant and length of new shoot(cm) in Kinnow

From the present investigation it is also concluded that effect of Treatment T8 i.e., SOIL + COCOPEAT + IBA1000ppm was found to be best in terms of Number of days to root formation (initial rooting), Root length(cm), Survival percentage, Number of new sprouts per layered plant, Number of new leaves per layered plant and Length of new shoots(cm).

From the present investigation it is concluded that the survival rate of rooted air layered plants is best in T8 i.e., SOIL + COCOPEAT + IBA1000ppm in Kinnow.

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