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EFFECT OF DIFFERENT GROWTH REGULATORS ON ROOT INDUCTION OF LIGHT WEIGHT DATE PALM SUCKERS

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ABSTRACT

The present investigation was carried out at Horticultural Research Institute, Ayub Agricultural Research Institute, Faisalabad during 2017-2019 to evaluate the effect of different growth regulators on root induction of Date palm suckers. There were six treatments i.e., T_0 (Control), T_1 (Indol butyric Acid (IBA) @2000 ppm), T_2 (IBA@4000 ppm), T_3 (Naphthalene Acetic Acid (NAA) @2000 ppm), T_4 (NAA@3000), T_5 (IBA@2000 ppm + NAA@2000 ppm). Growth regulators significantly affected the survival percentage, number of leaves, leaf length and number of roots plant^{-1}. Results showed that IBA@4000 ppm gave maximum success percentage (76.3%), highest survival percentage after 90 days (43.8%), maximum number of leaves (4.5), highest leaf length (20.6cm) and highest number of roots plant^{-1} (24.8). In view of these results, it is concluded that IBA can be used @ 4000 ppm for better root induction of Date palm suckers.

Keywords: date palm, growth regulators, IBA, NAA, suckers

INTRODUCTION

Date palm (*Phoenix dactylifera*), member of family *Arecaceae* is one of the oldest cultivated fruit trees on earth. It is an income creating source having potential of being staple food with good quality as its fruit is enriched with higher mineral contents (Hazzouri *et al*., 2015). It occupies fourth position after citrus and mango in Pakistan with respect to area (98415 ha), production (540606 tons) (FV and C, 2018-19). Date palm flourishes in areas characterized by warm, low humidity, predominantly during fruit development (Barghini *et al*., 2007). Moisture has adverse effect on fruit quality, as high moisture leads to fruit cracking. Its cultivation might be properly done in marginal lands because of the fact that it can be planted in a variety of soils with variable amounts of organic and mineral nutrients (Eoin *et al*, 2016).

Date palm holds religious value in three of the foremost religions of this world. Date palm is quoted many times in the Holy Book of Islam and in the Hadith, thus, making it the most frequently quoted plant of all plant species. In similar fashion, date palm tree and fruit is also admired in Judaism and Christian beliefs and norms, has been in association with numerous religious rituals such as Palm Sunday and Passover (Musselman, 2007).

Date fruit of date palm tree, can be deemed as an ideal food a person can have, which provides a vast range of essential nutrients with numerous possible health benefits. Conventionally, dates have been believed to be staple food of the Arab Gulf countries (Erskine *et al*., 2004). The physical characteristics including size, color, shape, freeness from defects, texture or mouth feel, flavor and of course nutritional value are the quality variables of significant importance (Wills *et al*., 1998). Dates can be taken in numerous diverse ways. Dates are consumed as a fresh commodity (30%-40%) or as dried (60%-70%) at Rutab (semi ripe) and Tamar (fully ripen) stages passing slight or no processing steps (Al-Shahib *et al*., 2003). Dates are generally eaten as such or can be taken with milk, yoghurt or Arabian coffee. In its processed form, it can be used as syrup, jellies, jams, paste and pickles and are being used in several confectionary or baked items together with coconut, chocolate, vinegar, honey and many others (Besbes *et al*., 2009).

Being dioecious in nature and needing cross pollination, date palm trees cannot be propagated sexually for commercial fruit production. Date palm trees propagation is mainly done by means of offshoots or so-called suckers. Large sized ground suckers are usually used for this purpose. Small sized and aerial (high and unrooted) suckers are of no practical

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use due to their low survival chances because of absence of roots essential to get penetration in soil. They are generally discarded during their separation from mother plants. Nevertheless, these offshoots can revive roots and may be used effectively if an inverted mist system is used. However, reduced number (i.e. each tree produces 2-3 offshoots/ year thus giving 15-30 offshoots in a period of 12-15 years), variation in their age, size and weight on a single mother tree, slow growth and very high mortality rate of the transplanted rooted suckers are the major constraints (Afzal *et al*., 2011).

To overcome the problem of poor or no root initiation in aerial suckers several approaches have been made with variable results. Hence current investigations were therefore, initiated to determine the effect of different growth hormones for root induction in aerial offshoots of various date palm cultivars to utilize them successfully for propagation with ultimate increase in acreage and its cultivation in marginal areas.

MATERIALS AND METHODS

This experiment was conducted during 2017-2019 at experimental area of Horticultural Research Institute, AARI, Faisalabad (Latitude 31.42^{o}N, Longitude 73.09^{o}E, Elevation 189m). Climate of the experimental site is characterized as sub-tropical with hot dry summer and cold winter.

Soil analysis of experimental area

Depth (cm)	pH	Organic Matter (%)	Available Phosphorus (mb kg^{-1})	Available Potassium (mb kg^{-1})	Saturation (%)	Texture
0-15	8.48	0.98	37.1	149	34	Loam
15-30	8.4	1.19	30.2	129	34	-
30-45	8.4	1.54	19.2	129	32	-

The experiment was carried out on approximately seven to eight years old date palm variety. Ground suckers as well as aerial suckers of weight ranging from 1 to 2kg were separated from Khudrawi date palm cultivar during early spring. After separation, these suckers were planted in soil for experiment. Date palm suckers were spaced 2×2 feet apart and received uniform cultural practices throughout the experimental period. Six plants of similar size and vigor were included in each treatment. The treatments were replicated three times. The following treatments were applied:

- T_0 (Control)
- T_1: Indol butyric Acid (IBA@2000 ppm)
- T_2: Indol butyric Acid (IBA@4000 ppm)
- T_3: Naphthalene Acetic Acid (NAA@2000 ppm)
- T_4: Naphthalene Acetic Acid (NAA@3000 ppm)
- T_5 (IBA@2000 ppm + NAA@2000 ppm)

For preparation of solution (IBA@2000 ppm), 0.2g of IBA was weighted by using weighing balance and dissolved in 1M solution of NAOH and 100ml distilled water. Rest of the solution was prepared by above mentioned method. These treatments were applied using quick dip method by dipping the bases of offshoots/ suckers in solutions for 1 minute and planted in experimental plot. The following data were recorded i.e. success %age, survival %age after 90 days, number of leaves, leaf length and number of roots plant^{-1}. Leaf length was measured by using measuring scale. The experiment was performed under Randomized Complete Block Design (RCBD). The collected data was analyzed utilizing software Statistix. Analysis of variance (ANOVA) techniques were used to test the overall significance of the data, while the Least Significant Difference (LSD) test ($P \leq 0.05$) was used to compare the differences among treatment means (Steel *et al*., 1997).

RESULTS AND DISCUSSION

Success %age

The data related to success% age of Date palm suckers showed significant results when analyzed statistically. According to results T_2 (IBA@4000 ppm) significantly enhanced the success %age of Date palm suckers (76.3%), followed by T_1 (2000 ppm IBA) with 69.5%, T_5 (IBA@2000 ppm + NAA@2000 ppm) (66.5%) and T_4 (NAA@3000 ppm) (59.3%) respectively. The minimum success %age was found in control (45.5%) followed by T_3 (NAA@2000 ppm) (53.8%). Bakr *et al*. (2010) also found similar results previously in date palm suckers injected with IBA@3000 ppm or NAA@3000 ppm and planted in mid-March recorded the best success percentage, number of roots, length and length of developed leaves for date palm cultivars Hayani, Sewy and Zaghloul. Highest success percentage was recorded previously by Rasmaia *et al.* (2013) with IBA application on date palm suckers of cultivar Zaghloul@4000 ppm followed by 2000 and 1000 ppm in comparison with control treatment with lowest success percentage.

Survival % After 90 days

The results regarding survival percentage indicated that IBA@4000 ppm showed maximum survival %age recorded after 90 days (43.8%) sequenced by IBA@2000 ppm and NAA@2000

ppm (31%), IBA@2000 ppm (27%), NAA@2000 ppm (25.5%) and NAA@3000 ppm (19.5) respectively. On the other hand, control gave minimum survival percentage (9.19%) when calculated after 90 days. These results are in accordance with previous results of Bakr *et al*. (2010) in date palm cultivars Hayani, Sewy and Zaghloul. Present results can be compared with the previous study of EI-Kosary (2009), who stated that rooting hormones significantly increase the rooting percentage in date palm suckers; the maximum percentage was shown by IBA treatment followed by NAA and IAA. On the other hand, the combined treatment of NAA+IAA and alone IAA gave low rooting percentage. This might be due to high IAA oxidase activity.

No. of leaves

The analyzed data concerning No. of leaves of Date palm suckers is given in (Table 1). The results revealed that highest No. of leaves (4.5) were calculated with higher level of IBA i.e., 4000 ppm. However, the combined levels (IBA@2000 ppm + NAA@2000 ppm) showed (3.5) No. of leaves followed by single doses of NAA@2000 ppm (3.3) and IBA@2000 ppm (3.1) respectively. The lowest No. of leaves (1.8) were recorded in control treatment. These results confirmed the previous findings of Al-Samaraec, (2010) showed that IBA different concentrations increased rooting percentage, root length, number of roots and longest leaves of *Lawsonia inermis* L. plants. It was observed from previous study of Rasmaia *et al*. (2013) that more number of roots produced in direct relation with application of IBA@4000 ppm and 2000 ppm while less number of roots were observed in control treatment. It might be due to effect of growth hormones that enhances the cell division, multiplication and cell enlargement.

Leaf length (cm)

The leaf length recorded after 3 months revealed significant results when analyzed statistically. T_2 (4000 ppm IBA) significantly increased the leaf length (20.6cm) followed by T_4 (3000 ppm NAA) (17.1 cm), (T_1+T_3=15.3cm), T_3 (NAA@2000 ppm= 15cm) and T_1 (IBA@2000 ppm= 14.5cm) respectively. Whereas, T_0 (Control= 9.0cm) showed lowest leaf length of Date palm suckers. These findings are in agreement with previous results of Zirari and Ichir (2010). Al-Jabary (2010) observed enhancement in rooting percentage, root length, number and diameter of roots by application of IBA in aerial date palm cultivar Hillawi through injection method. Zebari (2011) found that, high levels of IBA 1500 and 2000mg/l were increased diameter of shoots in fig cultivars. The increase in length of roots might be due to high rate of cell division and cell elongation during the development process of roots by application of root hormones.

Number of roots plant^{-1}

Mean values of number of roots plant^{-1} are significantly affected by different levels of IBA and NAA. Large number of roots (24.8) were recorded in suckers treated with IBA@4000 ppm followed by combined levels of IBA (2000 ppm) and NAA (2000 ppm) with (20.3) number of leaves. The lowest number of roots (11.0) were counted in control treatment followed by higher level of NAA@3000 ppm (13.9). These findings are in favor with those of Sun and Bassuk (1991) who observed root formation in date palm suckers with root hormones. Similarly, Nasir (1996) also reported increase in number of roots with higher concentrations of IBA. Al-Ghamdi (1988) injected IBA@000-8000 mg/l in three cultivars, Khalas, Ruziz and in Shishi and did not observe any root promotion. He linked root inhibition with improper IBA concentration or time and method of application. (Zaid *et al*., 2002) did not find any positive effect of IAA and IBA each @ 50 and 100mg/l. However, he reported root initiation by NAA at the same levels.

Table 1. Effect of root promoting hormones on physical parameters of Date palm suckers

Treatments	Success % age	Survival % after 90 days	No. of leaves	Leaf length (cm) after 3 months	No. of roots/ plant
T_0(Control)	45.5c	9.19e	1.8d	9.0c	11.0d
T_1 (IBA@ 2000 ppm)	69.5b	27.0c	3.1ab	14.5b	18.1b
T_2 (IBA@ 4000 ppm)	76.3a	43.8a	4.5a	20.6a	24.8a
T_3 (NAA@ 2000 ppm)	53.8b	25.5c	3.3bc	15.0b	14.8c
T_4 (NAA@ 3000 ppm)	59.3b	19.5d	2.8cd	17.1b	13.9cd
T_5 (IBA@ 2000 ppm + NAA @2000 ppm)	66.5b	31.0b	3.5d	15.3b	20.3b
Grand mean	16.18	25.84	3.15	16.18	17.8
LSD value	2.44	1.53	0.78	2.44	2.66

Any two means not sharing a common letter are significantly different at 5% level of probability.

CONCLUSION

In view of the above cited results, it can be concluded that higher dose of IBA@4000 ppm

was found superior with higher rate of survival %age, more number of leaves, maximum root length and higher No. of roots significantly as compared to other treatments. So, it is recommended that IBA@4000 ppm can be used for root induction of Date palm suckers. Because IBA@4000 ppm promotes higher cell division and elongation when observed under microscope.

AUTHOR'S CONTRIBUTION

A. Bakhsh: Contribution as execution of research trial.
M. Z. Rashid: Contribution as execution of research trial.
M. M. Abbas: Design the research study and conducted the biochemical analysis.
Amina: Write up and assistance in the research.
S. Rashid: Removed plagiarism and statistical work.

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