THE INTERNATIONAL JOURNAL OF SCIENCE & TECHNOLEDGE

Effects of Auxin (IBA) Concentrations with Different Dipping Time on Root Ability of Grape Cuttings (*Vitis Vinifera*)

Umbreen Shahzad
Assistant Professor, College of Agriculture, Bahauddin Zakariya University, Pakistan
Tahir Shahbaz
Research Student, College of Agriculture, Bahauddin Zakariya University, Pakistan
Azhar Abbas Khan
Assistant Professor, College of Agriculture, Bahauddin Zakariya University, Pakistan
Zeshan Hassan
Assistant Professor, College of Agriculture, Bahauddin Zakariya University, Pakistan
Summar Abbas Naqvi
Assistant Professor, Department of Horticulture, University of Agriculture, Pakistan
Mudassar Iqbal
Scientist, Vegetable Research, Ayyub Agriculture Research Institute, Faisalabad, Pakistan
Tahira Abbas
Assistant Professor, College of Agriculture, Bahauddin Zakariya University, Pakistan
Muhammad Shahjahan
Researcher, Department of Plant Pathology, PMAS-Arid Agriculture University Rawalpindi, Pakistan

Abstract:
Vitis vinifera is the most famous edible species of grapes which is commercially propagated through hard wood cuttings. It belongs to Vitaceae family having sixty species. Hard woodcuttings take more time to sprout that is why success rate is low. To minimize this problem the present study was carried out to evaluate the effect of Auxinindole-3-butyric acid (IBA) concentrations (0 and 2000 mg/l) with three dipping times (0, 5 and 10 seconds) on rooting of grape cuttings of NARC Black, Thomson, Perlette, Flame seedless and King ruby varieties. The experiment was laid out according to Completely Randomized Design with three replicates. Result revealed that maximum leaf area (24.03), number of leaves per plant (9.04), root length (16.721), number of roots (37.68) and early rooting was obtained by Auxin (IBA) 2000 mg/l concentration with 10 second dipping duration. Auxin (IBA) 2000 mg/l concentration with5 second dipping time also increased the leaf area (22.57), number of leaves per plant (7.84), root length (16.01), number of roots (35.71)and early rooting as compared to control. In variety correlation in all parameter Thomson and NARC Black show best performance and low performance by Flame seedless. The results concluded that Auxin, IBA 2000mg/l with 10second dipping time is best to enhance growth, survival and rooting of grape cuttings.

Keywords: Grapes, vitis vinifera, Auxin, IBA, Grapes cutting

1. Introduction

Grape (*Vitis vinifera*), which is foremost fruit of regions of temperate, which is reaching nearly seventy seven million tons of fruit production within the world in 2013 (FAO, 2015). *Vitis vinifera* are edible species of grapes which is commercially propagated through hard wood cutting. Vitaceae family comprises about sixty species. *Vitis vinifera* (European grapes) *Vitis rotundiflia* (Muscadine Grapes) and *Vitis labrusca* (American grapes) belong to most important species of vitaceae family. They belong to genus Vitis. *Vitis vinifera* (European grapes) are adopted in subtropical condition but other two species are adaptable in temperate climate. Grapes are widely scattered in the world. They are berry fruits of deciduous woody vines. They bear fruit under mild climate. Red Ruby and Flame seedless grapes are the most important horticulture crop in Pakistan due to its seedless quality. They are consumed as fresh, juice, jam and jellies as frozen products. They are trained on wires because they could not bear weight. They have thick skin so they are handled carefully. *Vitis vinifera* is edible species is native to Mediterranean region. They require long warm, dry summer and winter for their best development. This species is widely scattered in the sub-tropical regions of the world. The family of the Grapes is Vitaceae and genus vitis. The Vitis genus is widely dispersed, mostly between 25° and 50° N latitude in Eastern Asia, Europe, The Middle East, and Northern America. In the genetic diversity it is present in high level genus Vitis contains more than fifty species (Aradhya *et al.*, 2003).

In Pakistan *Vitis vinifera* is commercially propagated through hard wood cutting. One-year old branch is used to make cuttings. Normally planted cutting take more time to sprout. There number of roots also less and survival percentage is also minimum. Auxin hormones are applied on hard wood cutting for stimulation of adventitious roots. Naturally plant produce Auxin in its different part but artificial Auxin carried it to succession by increasing the rooting. Important role of

Auxin is familiar in stimulation of rooting and root formation on cuttings of grapes. NAA (Naphthalene acetic acid) and IBA (indol-3-butyric acid) have good effect on cutting then IAA (Indole acetic acid) (Khan *et al.*, 2006). IBA is well known Auxin hormone which regulate growth of cutting in different aspect like cell elongation and initiation of root formation (Wayne, 2000). Mostly IBA (indol-3-butyric acid) is used for applying on hard wood cutting to initiate rooting. IBA (indol-3-butyric acid) applied on cutting to initiate rooting and increase number of roots and survival percentage of cutting.IBA has greatest influence on rooting of cuttings. Which cause increase in number of roots and survival percentage (Singh *et al.,* 2011).Theapplication of IBA (indol-3-butyric acid) in 2500-4000 mg/l obtain to exciting result in apple, olive and plum rooting from hardwood cuttings (Hartmann *et al.*, 1993). Maximum numbers of roots were obtained in grapes (*vitis vinifera*) with 4000 mg/l IBA (indol-3-butyric acid) (Glavi*et al.*, 2013).

Grapes cutting take more time to sprouting and survival percentage is also low. Grapes are cultivated by hard wood cutting. Normally planted cutting take more time to sprout and the success rate is also low. Auxin (IBA) is one of the most important hormones that is used on the stem cutting for accelerating the formation of adventitious roots and also increase the survival percentage. This study was design to investigate the effects of IBA on grapes cutting, early rooting and survival percentage.

2. Material and Methods

This research was carried out in nursery area of College of Agriculture Bahauddine Zakriya University Bahadur Sub Campus Layyah.

2.1. Materials

Grapes cutting was taken from Basra grapes farm and Peer Jaggi grapes farm of Thompson, Perlette, NARC black, King ruby and Flame seedless varieties. Secateurs are needed to make cuttings of grape. Cutting length was 30 cm having 3-4 buds on each cutting. Polythene bags 200 (12x18cm) were filled by agriculture soil. Soil filled bags were placed in nursery area. IBA (indol-3-butyric acid) solution was prepared. In one litre distilled water 2000 mg IBA (indol-3-butyric acid) was dissolved (Table No.1).

Treatment	IBAConcentration(mg/L)	Dipping Time(Seconds)
To	Control	0
T1	2000	5
T2	2000	10

Table 1: IBA Concentration and Dipping Time on Grapes Cutting

2.2. Method

Distilled water was used to make solution of Auxin IBA with 2000 mg/l. IBA was dissolved by stirrer in distilled water and solution was prepared. IBA solution was prepared by dissolving the powdered hormone in distilled water and stir on magnetic stirrer. One year old hard wood cutting having 30cm length with 3-4 buds was used. Cuttings were prepared by secateurs. A slanting cut was made at the end and round cut was made on top of cutting. Five varieties (Perlette, Thompson, NARC black, Red ruby and Flame seedless) were used in this experiment and cuttings were prepared from these varieties. Two concentration levels of Auxin (IBA) (0; 2000 mg/l) with three dipping time (0, 5, 10 second) were used.
In To (control) no treatment was applied. In T1 IBA solution was taken in a bowel then trimmed cuttings was dipped in IBA solution (2000 mg/l) for five second and in T2 cutting were dipped in IBA solution (2000 mg/l) for ten (10) second. All treated cuttings were planted in soil filled polythene bags. After planting the cuttings irrigation was applied.

2.3. Parameters

- Sprouting data: Data were taken when first sprouted bud was entering in vegetative stage. 50% data was taken when in a treatment 50% cutting completely sprouted. 100% data was taken when in a treatment 100% cutting complete.
- Leaf data:Numbers of leaves were counted of each selected plant. Five leaves were selected from each plant and leaf data of each leaf were taken.
- Roots data:The selected plant was uprooted carefully from bags.Roots were counted of cutting.Root length (cm) was noted of largest root. Then uprooted plant again planted into bags and irrigated.
- Statistical analyses:The collected data was analyzed by using software (Statistix 8.1) and means were compared by using LSD test at 5% probability level.

3. Results

3.1. Leaf Area

In the result data was highly significant according to the Analysis of variance for the leaf area (Table.2). The leaf area was increased with increasing the dipping time of grapes cutting in IBA solution. Minimum leaf area was noted in the control (To) is 19.44 (Table.2) and maximum result was observed in (T2) is 24.03 (Table. 3) with 10second dipping time of cuttings with 2000mg/litre IBA concentration. (Table.2)

Source of Variation	DF	SS	MS	F value	P value
Treatment	2	165.056	82.5279	37.25	0.0000**
Variety	4	158.250	39.5626	17.86	0.0000**
Trt*Varty	8	64.789	8.0986	3.66	0.0044**
Error	30	66.468	2.2156		
Total	44	454.563			
Grand Mean 22.018		CV 6.76			

Table 2: Analysis of Variance of Leaf Area (LA) of Grapes Treated by IBA Solution
*DF=Degree of Freedom, SS= Sum of Square, MS= Means Square, **= Highly Significant*

Treatment	Mean + Homogeneous Groups
To (control)	19.44 C
T1 (IBA+5sec)	22.57 B
T2 (IBA+10sec)	24.03 A

Table 3: Comparison of Means of Different Dipping Time with in IBA Solution for Leaf Area

3.2. Number of Leaf

Statistical analysis of variance (ANOVA) regarding number of leaf showed highly significant effect of IBA solution on grapes cutting (Table. 4). Maximum number of leaf (9.02) was observed in T2, while minimum number of leaves was observed in control treatment to (Table.5).

Source of Variation	DF	SS	MS	F value	P value
Treatment	2	78.539	39.2694	33.19	0.0000**
Variety	4	18.473	4.6183	3.90	0.0114**
Trt*Varty	8	14.346	1.7932	1.52	0.1935NS
Error	30	35.492	1.1831		
Total	44	146.850			
Grand Mean 7.5764		Cv 14.36			

Table 4: Analysis of Variance for Number of Leaf of Grapes Treated by Iba Solution
*DF=Degree of Freedom, SS= Sum of Square, MS= Means Square, **= Highly Significant, NS=Non Significant*

Treatments	Mean + Homogeneous Groups
To (control)	5.84 C
T1 (IBA+5sec)	7.84 B
T2 (IBA+10sec)	9.04 A

Table 5: Comparison of Means of Number of Leaf of Grapes with in Treatments

3.3. Number of Roots

Statistical analysis of variance (ANOVA) regarding to the number of roots showed highly significant effect of IBA solution on grapes cutting (Table. 6). Maximum number of roots (37.68) was observed in T2, while minimum number of roots (14.53) was observed in control treatment To (Table.7).

Source of variation	DF	SS	MS	F value	P value
Treatment	2	4942.47	2471.24	241.41	0.0000**
Variety	4	10.25	2.56	0.25	0.9072NS
Trt*Varty	8	103.68	12.96	1.27	0.2976NS
Error	30	307.10	10.24		
Total	44	5363.49			
GrandMean 29.310		CV 10.92			

Table 6: Analysis of Variance of Number of Roots of Grapes Cuttings Treated by IBA Solution
*DF=Degree of Freedom, SS= Sum of Square, MS= Means Square, **= Highly Significant, NS=Non Significant*

Treatments	Mean + Homogeneous Groups
To (control)	14.53 B
T1 (IBA+5sec)	35.71 A
T2 (IBA+10sec)	37.68 A

Table 7: Comparison of Means for Number of Roots (NR) of Grapes within Treatments

3.4. Root Length

Statistical analysis of variance (ANOVA) regarding number of leaf showed non-significant effect of IBA solution on grapes cutting (Table. 8). In this result maximum number of leaf 16.72 was observed in T2, while minimum number of leaf (15.88) was observed in control treatment To (Table. 9). Statistical analysis of data regarding number of leaf showed

highly significant (Table 5.9) effect of IBA solution on grapes cutting with increasing the time duration of dipping of grapes cuttings. Table. 8. Analysis of variance for root length (RL) of cuttings in correlation of treatment and variety.

Source of variation	DF	SS	MS	F value	P value
Treatment	2	6.115	3.0575	1.44	0.2525NS
Variety	4	84.087	21.0217	9.91	0.0000**
Trt*Varty	8	10.044	1.2555	0.59	0.7766NS
Error	30	63.630	2.1210		
Total	44	163.876			
Grand Mean16.206		CV8.99			

Table 8: Analysis of Variance of Root Length of Grapes Cuttings Treated by IBA Solution
*DF=Degree of Freedom, SS= Sum of Square, MS= Means Square, **= Highly Significant, NS=Non Significant*

Treatment	Mean + Homogeneous Groups
To (control)	15.882 A
T1 (IBA+5sec)	16.013 A
T2 (IBA+10sec)	16.721 A

Table 9: Comparison of Means of Root Length (RL) of
Grapes with In Treatments

4. Discussion

In this research Iindole-3-butyric acid (IBA) with 2000mg/l concentration with 10 second dipping time of grapes cutting is best for maximum leaf area, number of roots, and root length and survival percentage**.** In the research of McGuire*et al.,* (1998) highest root length was obtained in oleander cutting was with 2000 and 3000 mg/l NAA, and 400mg/l showed negative effect on the root cutting. In this research highest root length was obtained in grapes cutting with 2000mg/l with 10 second dipping time best was obtained due to prolonged the dipping time. In the research of Farooqi *et al.,* (1994) on *Rosa damascene* Mill and studied the effect of IBA. They found the increasing trend of rooting percentage, number of roots per cutting, length of the longest root (cm), thickness of the root (cm), fresh weight of root and dry weight of root with increasing concentration of IBA from 100 mg/l to 300 mg/l. Chalapathi *et al.,* (2001) reported that cuttings treated with IBA 500 mg/l was found to be superior with respect to shoot length, number of branches, number of leaves and root length, survival percentage and sprouting percentage. He also stated that better rooting and sprouting of *stevia* cuttings can be obtained through prolonged dipping of *stevia* cuttings in 50 mg/l IBA solution. Glavi*et al*., (2013) found the result in his research that the maximum number of roots, root length, and root fresh and dry weight was obtained by applying 4000 mg/l IBA. But in this research maximum number of roots, root length, leaf area, number of leaf and survival percentage was obtained with 10 second dipping time of cutting in 2000mg/l solution of IBA.

5. Conclusion and Summary

Grapes cutting show maximum result in number of leaf, leaf area, number of roots, and root length and survival percentage with 2000mg/l IBA concentration with 10 second dipping time in all varieties. A minimum result was observed in all parameters number of leaf, leaf area, number of roots, and root length and survival percentage with 2000mg/l IBA concentration with 05 second dipping time. Indole-3-butyric acid (IBA) with 2000mg/l concentration with 10 second dipping time of grapes cutting is best for maximum leaf area, number of roots, and root length and survival percentage for following five varieties (Perlette, Thomson, NARC black, Red ruby and Flame seedless).

6. References
i.   Aradhya, M.K., Dangl, G.S., Prins, B.H., Boursiquot, J.M., Walker, A., Meredith, C.P., Simon, C.J. 2003. Genetic structure and differentiation in cultivated grape *Vitis vinifera* L. Genet Res. 81:179–92.
ii. Chalapathi M V, Thimmegowda N D, Kumar S, Gangadhar G, Rao E, Mallikarjun K. Influence of length of cutting and growth regulators on vegetative propagation of Stevia (*Stevia rebaudiana* Bert.). Crop Res. 2001. 21: 53-56.
iii. FAO, 2015, Food and Agriculture Organization of United Nations. Statistics division. http://faostat3.fao.org. Accessed 05 Oct 2015.
iv. Farooqi A A, Shenoy R, Ramu B S. Influence of planting material and growth regulators on the rooting of cutting of *Rosa damascena* Mill. Indian Perfumer, 1994. 38: 133-143.
v.   Glavi, M., M.A. Karimian and S.R Mousavi. 2013. Effects of Different Auxin (1 IBA) Concentrations 2 and Planting-Beds on Rooting Grape Cuttings (*Vitis vinifera)*.Annual Review & Research in Biology 3(4):517-523.
vi. Khan MS, Khan RU, Waseem K. 2006. Effect of some auxins on growth of Damask rose cuttings in different growing media. J. Agric. Soc. Sci. 2(1): 13-16.
vii. Mc Guire J J, Albert I S, Shutak V K. Effect of foliar applications of 3-indolbutyric acid on rooting of cuttings of ornamental plants. American Society for Horticultural Science. 1998. 93:699-704
viii. Singh KK, Rawat, JMS, Tomar YK. 2011. Influence of IBA on rooting potential of Torch Glory *Bougainvillea glabra*during winter season. Journal of Horticultural Science and Ornamental Plants, 3 (2): 162-165.
ix. Wayne, S.J. 2000. Areview of factors affecting plant growth. Univ. of Nevada. Ren, Marianne ames. Graduate Fellow. PP. 5 – 19.