Effect of Different Concentration of Plant Hormones (IBA and NAA) on Rooting and Growth Factors in Root and Stem Cuttings of Cordyline Terminalis

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***Abstract*—In this research the effect of different concentrations of Indolebutyric Acid, Naphthalene Acetic Acid and the combination of these two regulators on rooting and root growth factors of root and branch grafts of *Cordyline terminalis* were considered. The graft instances were produces from the mother branches which were planted in greenhouse. This experiments in completely random model framework and with 4 replications and 16 treatments was performed. IBA and NAA regulator in 4 levels include 0, 1000, 2000 and 3000 mg/L and IBA + NAA combination consist of ‹1000 + 3000 ‹1000+2000 ‹1000+ 1000 + 2000 ‹ 3000 + 1000 ‹ 2000+3000 ‹2000+2000 ‹2000 +1000 3000 +3000 ‹ 3000 mg/L was imposed the end of grafts were put in above solution around 5 seconds and the factors such as callus percent, the percent of the grafts that have root, moisture weight, dry weight, number and Length of root and number of branch were studied. The results was showed that highest of root fresh weight, root dry weight, root length and number of branches is regard to the treatment of combined density NAA (2000) + IBA 1000 mg/L that had the meaningful difference in statistical level of 5%. Meanwhile, this treatment was not meaningful on callus percent, percent rooting root number in statistical level of 5%.**

***Index Terms*— indolebutyric acid (IBA), naphthalene acetic acid (NAA), Cordylineterminalis**

I. Introduction

Cordyline is belong to Agavaceae farmily and its regional for equator and semi equator. It is in the form of green trees and shrubs with the nice leaves. In it's natural environmental has good growth and got root and it's lengthy become more then 3 meter. Its root is a long, thick, white and sweet. Leaf buds clusters are arranged in close spirals to each other. The leaves are flat, pliable Long, it's color is shiny green with red, pink, violet, Purple, orange, yellow and the leaves have 30-60 cm length and about 35 cm width. There is a lot request for many of Cordyline species. The *Terminalis* species is one of the most favorite of Cordyline family [1]. For of preservation of genetic permanency of various and colored level of Cordyline, it's proliferation is perform by Asexual pathway [2]. One of the growing Asexual reproduction of Cordyline is preparing the graft of the semi wooden stems. The necessity of existence of natural Auxin or artificial Auxin for producing of malapropos roots in grafts, is well known today and it is distinguished that division of initial cells of root depend on internal Auxin and that Auxin that is put in artificial way [3] . In research proliferation of Cordyline stem in laboratory environment and got rooting of above grafts in natural environment show that accompany of BAP (4 ppm) with NAA (0/5 ppm) according to other nurseries, produce more stems [4]. They reported that there is not a significant difference in getting root of different density of IBA but there was a significant difference in number and the length of root. Reference [5] shows that the existence of BAP (2 ppm) with NAA (0/5 ppm) cause to producing of longer stems and more leaves in Dracaena. Reference [6] reported that nursery of *Bouguainvillea glabra* grafts with different levels of Auxin hormone caused that getting rooting percent, number and dry weight of root according to instance increased in 5% level. Reference [7] with Probing the of artificial Auxin in getting root of camellia shrub's grafts shows that the bilateral effect of 2000 ppm IBA + 2000 ppm NAA was the most effective nursery. Reference [8] observed that in *Camellia japonica* nursery of 2500 ppm IBA + 1250 ppm NAA & nursery of 3000 ppm IBA is able to increase 77 to 81 percent of getting root of grafts. Cordyline in Iran ration were keeping in warm and moisture nurseries. For prolife producing in nursery environment, use of ways that decrease the growth period and plant proliferation (like effective hormones in getting root) will be profit in the case of economic. The aim of existence research of optimization of growth and proliferation of *Cordyline terminalis*, is because of economize the operation of growth and proliferation of that in nursery environment.

Manuscript received August 18, 2013; revised October 24, 2013.

II. Material and Methods

doi: 10.12720/jomb.3.3.190-194

For studying of the effects of different concentrations of IBA and NAA and the combination of these 2 regulator (IBA + NAA) on getting root and growing factors of root and branches graft of *Cordyline terminalis*, there were an experiment from 21 September 2012 in time of 6 weeks in a Greenhouse around Challus Mazandaran of Iran. The grafts that have leaf were prepared from the end of mothers plants which were in environmental conditions and biologic a like in the bed of greenhouse. The using nurseries are inclusion of : IBA regulator in 4 levels (0, 1000, 2000, 3000 ppm) and NAA regulator in 4 levels (0, 1000, 2000, 3000 ppm) and combination of IBA + NAA in 9 levels (1000+1000, 1000+2000, 1000+3000, 2000+1000, 2000+2000, 2000+3000, 1000+3000, 2000+3000, 3000+3000 ppm). For treatment of the grafts, about 2/5 cm of the down of them were put in to the above solution around 5 seconds, then they were put in Benomyl powder (unit mushroom) 50%. Then the grafts were planted in the bed include cocopeat and perlite (in scale 3 to 1) and during the test the necessity nursery were performed. The wet of greenhouse was 60-80% and the light was not right and the mean of the temperature in the environment greenhouse was 18° to 25° C. This experiment was in the form of a random pattern includes of 16 treatments and 4 repeat and in every repeat 10 grafts to was performed. After of 15 days, the percent of getting callus were evaluated and in 5 December 2012 after the end of experiment time, the characteristics like the percent of grafts which got root, moisture weight, dry weight, number and the length of root, and number of branches were evaluated. Compotation of data's variance and the means test by use of SAS software and Tukey's Test in 5% level of Probility and Diagrams painting was implemented by Excel software.

III. Results

A. Fresh Weight and Dry Weight of Root

Evaluation of data's variance and mean according to the characteristic of fresh weight and dry weight of root shows that non 3 concentrations of 1000, 2000 and 3000 ppm of IBA and NAA, according to instance, does not show the significant increase in the case of statistics in the level of p= 5%. Two combined concentrations 2000 ppm NAA+1000 ppm IBA and 1000 ppm NAA+ 3000 ppm IBA caused to significant increase in P=5% level in fresh weight and dry weight of root. These two combined concentration have not significant difference with each other but the concentration of 2000 ppm NAA +1000 ppm IBA had more effect in increasing of fresh and dry weight of root (Table I, Fig. 1 and Fig. 2).

B. Root Length

Evaluation of data's variance and mean regard to the characteristic of length of root shows that non 3 concentrations 1000, 2000, 3000 ppm of IBA and NAA according to instance does not show significant difference in the level of P=5%. Combined concentrations of 2000 ppm NAA + 1000 ppm IBA caused to significant increase in the level of P=5% in fresh weight of root (Table I and Fig. 3).

C. Number of Branches (Leaf)

Evaluation of data's variance and mean according to the characteristic of number of branch (leaf) shows that non 3 concentrations of 1000, 2000 and 3000 ppm of IBA regarding to instance by statistic does not show significant. Number of branch in concentration of 1000 ppm NAA according to instance showed significant increase in the level of P =5%. By increasing the NAA's hormone concentration from 1000 ppm to 2000 and 3000 ppm the number of branches was decreased. This characteristic in concentrations of 1000 ppm NAA +1000 ppm IBA, 2000 ppm NAA+1000 ppm IBA, 3000 ppm NAA+2000 ppm IBA and 1000 ppm NAA+ 3000 ppm IBA according to instance shows significant increase in the case of statistic in the level of P=5%, that concentration of 2000 ppm NAA+ 1000 ppm IBA have the most effect (Fig. 4).

TABLE I. Data Variance Results of Factors Studying

Average							df	Changes Factors
Number of Branches	Callus Percent	Rooting Percent	Root Length	Root Number	Dry Weight of Root	Fresh Weight of Root		
3/6625	518/2292	406/25	48/1959	676/82917	0/1121	8/2855	15	Treatment
0/3542	377/6042	442/7083	7/4075	317/32292	0/0233	1/9638	48	error
							63	All
30/43	21/63	23/62	32/06	21/94	۳۰/۵۱	31/60	-	C.V.%
**0/0001	ns0/199	ns0/5512	**0/0001	ns0/0242	۰/۰۰۰۱**	**0/0001		Possibility

**: Meaningful in 1% Level, ns : Non-Meaningful

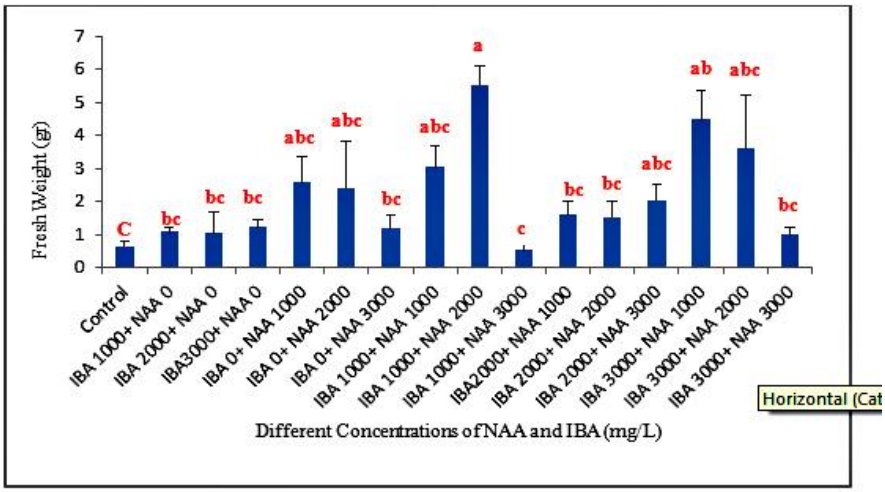

Figure 1. Effect of different treatments of NAA and IBA on fresh weight root

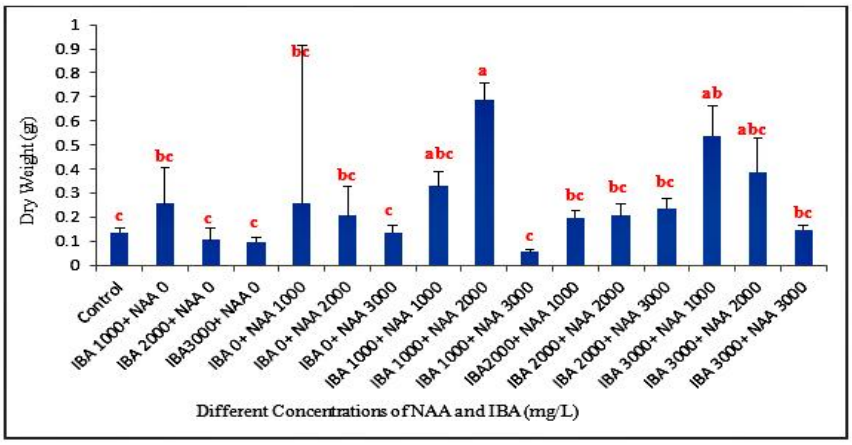

Figure 2. Effect of different treatments of NAA and IBA on dry weight root

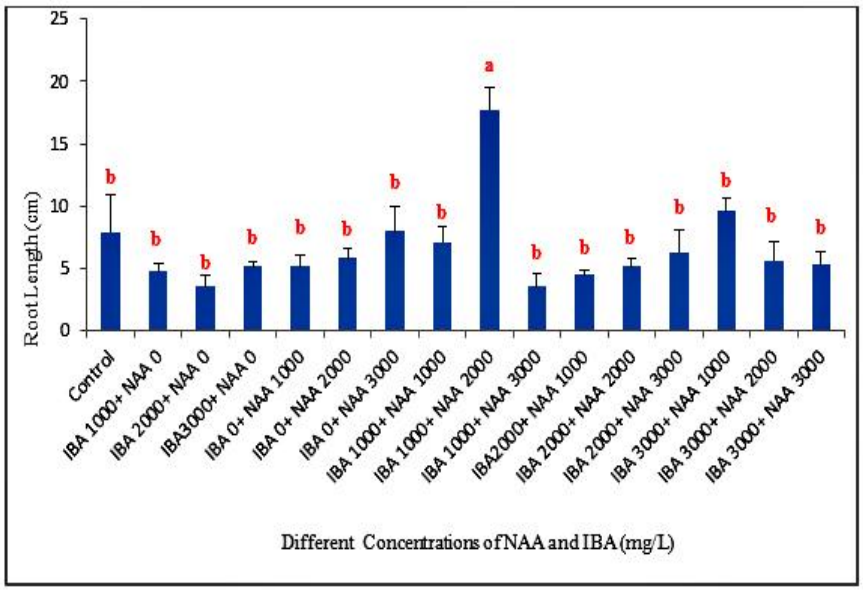

Figure 3. Effect of different treatments of NAA and IBA on root length

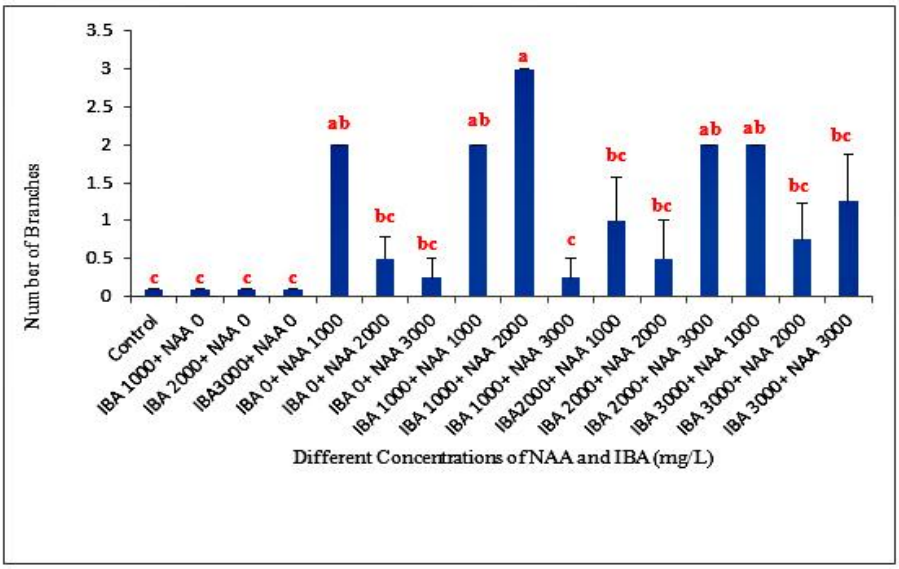

Figure 4. Effect of different treatments of NAA and IBA on number of branches

(Same letters of column don't have meaningful difference together)

D. *Percent of Getting Root, Percent of Getting Callus, Number of Root*

Evaluation of data's variance and means regarding to these characteristics shows that non the concentrations according to the instance does not show the significant difference. The number of root in all concentrations according to instance has increased and the best concentration for increasing of number of root was 2000 ppm NAA+3000 ppm IBA.

IV. Discussion

Base of conclusions of this research, treatments with IBA and NAA regulators on characteristics of root fresh weight, root dry weight, root length and number of branches of *Cordyline terminalis* had significant effect. The results shows that root fresh and dry weight in most of treatments had increase. According to this that Auxins diagnostic differentiation of vascular tissues and increasing the movement of material in the vessels involved [3]. Transport of carbohydrates from the leaf to root, the percent of dry materials of roots were increased [9]. About the number of branches (Leaf) treatments of grafts with NAA have better conclusion according to IBA that this have correspondence with other researcher's results [4], [5]. In treated grafts with NAA increasing of concentration from 1000 to 2000 and 3000 ppm cause to decrease the number of branches that can signify this thought that the auxins in prolific concentrations can be impediment of buds growth and even development of branches [10], [11]. The most deal of root fresh weight, root dry weight, root length and number of branches is regard to treatment of 2000 ppm NAA+ 1000 ppm IBA that was different with instance in the level of 5%. Use of auxin hormones in forming of callus and the percent of getting root of the grafts of Cordyline has not significant difference that were correspondence with Reference [4] and the cooperators researches. Probably Cordyline is not poverty of internal Auxin and it has optimum Auxin to a proper got root in itself. Despite that number of root has increase in all of treatments according to instance but this increasing was not significant. The most number of root in treatment of 2000 ppm NAA + 3000 ppm IBA is observed. Increasing of number of root in grafts was accompanied with decreasing of length growth. It can because of that by increasing of number of root, the existence material in grafts become expenditure for produce and growth of more roots, then because of lack of food in graft and deficiency of asimilates due to deficiency of number of leaves on graft, length growth of roots were decreased [12]. Combination of NAA and IBA in the most of treatment had better according to use of each one of these hormones lonely. It becomes in the many of researches that combine of easer material of getting root is more effective than usage of each one lonely [11], [6], [7], [10]. According to results of this research, use of Auxins hormones improve the root quality and number of branches, so cause to improving the grafts proliferation conditions for proliferation production in greenhouse.

Acknowledgment

The authors wish to thank of Islamic Azad University Tonekabon Branch. This work was supported by Islamic Azad University Tonekabon Branch.

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