

## Evaluate Use different Applications and Concentrations of Indole Butyric Acid For Vegetative Propagation of *Petunia hybrida* Plant

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**Abstract:** The aim of this study was to determine the best applications and concentrations of Indole-3-butyric acid (IBA) for vegetative propagation (stem cuttings) of *Petunia hybrid* plant with two terms incubation., Liquid (Dipping basal of cuttings) (LDBC) and Liquid (Foliar spray) (LFS) applications of IBA at (1000,1500 & 2000 ppm) produced greater rooting percentage (100%) with different incubation periods than did Powder (Dipping basal of cuttings) (PDBC) application of IBA at all levels., the highest significant values of root number / plant were recorded with two applications of IBA (LDBC) and (LFS) at 2000 ppm under different incubation periods (LFS) at IBA 2000 ppm after 21 days of incubation periods, outperformed significantly in giving a significant increase in root length (10.0 cm / plant) compared with other IBA treatments in the same incubation periods. (LDBC) application at IBA 1000, 1500 & 2000 ppm and (LFS) application at 2000 ppm were recorded significant values in fresh weight g / plant in the second incubation periods and highest significant values of root dry weight were recorded with data taken in the second incubation period with all applications to the level of IBA 2000 ppm.

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**Key words:** *Petunia hybrida*, vegetative propagation, Indole-3-butyric acid, Powder, Liquid, Foliar spray and incubation period.

### 1. Introduction

*Petuniahybrida* belongs to the plant family *Solanaceae*, and is an important medicinal and ornamental plant. Several species of *Petunia* sp. are ornamentals grown in gardens for their large, showy, multicoloured flowers and is also an important cut flower crop (Thenmozhi and Sivaraj, 2011). *P.hybrida* is an economically important ornamental plant species (Mol et al., 1985., Bradley et al., 1989., Huits et al., 1994., Solano et al., 1995., Davies et al., 1998., and Quattrocchio et al., 1998). *Petunia* is a mild-acting medicine possessing anti-microbial (Rahman et al., 2008) and shows the mildest anti-oxidation activity. Its leaves yield an important insecticide, widely used as natural insecticides, offer all the advantages of chemical compounds, that is, rapidity of action, activity against a broad range of insects, and rapid biodegradability (Kays et al., 1994). *Petunia* flower colors, except yellow, are derived from flavonoid and anthocyanins, *Petunia* is a good model for the study of flavonoid/anthocyanin biosynthesis because of its genetics and molecular biology (Holton and Cornish, 1995). *Petunia* sterones are steroidal ketones which occur in very commercial varieties of *P.hybrida*, several have been isolated from chloroform extracts from leaves and stem, and on the basis of common structural aspects have been designated into four groups: *petuniasterone* A-D (Elliger et al., 1988). Argostaneglycosides: *petuniosides* have been isolated from aerial parts of *P. hybrid* (Shingu et al., 1994).

The pigments in *petunia* flowers consist mainly of anthocyanins (pigmented) and flavonols (colorless) and are synthesized via the flavonoid biosynthesis pathway (Schram et al., 1984). Auxin liquid or powder products (talc) forms are commonly used in commercial cutting propagation as root-promoting chemicals. Commercial formulations commonly contain IBA, NAA, or a combination of the two, Auxin solution have traditionally been applied to the basal portion of cuttings, the site of subsequent root formation, by means of quick dip or an extended basal soak (Hartmann et al., 2002). On auxin application technique that has received little research application is a foliar spray application. Although other plant growth regulators are applied as spray under production conditions, root-promoting chemicals are not normally applied in the manner. The technique is known through verbal accounts from individuals involved in commercial propagation and from brief mention in literature, but without detailed research findings (Chadwick and Kiplinger, 1938., Kroin, 1992, and Hartmann et al., 2002). (Kroin, 2009) Reported that, Scientists soon proved the ideas of Darwin. Plants produce auxins in leaves (Darwin, 1880 and Thimann, 1977), The auxins move from the apical to the basal part of plant cuttings. Foliar application of bio-simulators of the natural auxin travel like the natural auxin. When used for root initiation, the threshold amount of all auxins are accumulated and utilized at the basal end.

From the above it turns out that, *Petunia* plant an important medicinal plant, as well as ornamental plants that produce cut flowers., so study aims to reach production of plantlets from *petunia* plant through the use of stem cuttings instead of seeds propagation, as well as, to get a larger number of seedlings during the season and to overcome the high price of the seeds Imported. Well as the difficulty of planting seed due to their small size, then use Different applications of (Indole-3-butyric acid- IBA) for facilitate the procedures for the mass production of plants.

## 2. Material and Methods

This research was conducted at a private farm in Giza Governorate, through two successful agricultural seasons (2012/2013-2013/2014) to assess the Different applications and concentrations of Indole-3-butyric acid (IBA-K), as well as the effect of incubation periods to the vegetative propagation of *Petunia hybrida* plant. Planted the seeds are used as a source of stem cuttings, inside the greenhouse of polyethylene for a period of 45-50 days in agricultural medium of (Peatmoss: Vermiculite: sand (1/1/2 - V/V/V, sequentially) in

Styrofoam trays. Was obtained the upperstem cuttings in the last week of February, up 5-7cm., and planted in Styrofoam trays which filled, Peatmoss and Vermiculite (1/1-V/V, sequentially) and taken into account during this period, the morning daily spray-irrigation for 10-12s to maintain a relative humidity of 95 –100% and daily maximum/minimum temperature was  $27 \pm 5^\circ$ . The stem cuttings was left under tunnel of polyethylene, inside greenhouse, to taking Results. Cuttings were treated as follows, (1) Powder (Dipping basal of cuttings) application, IBA mixed with talc powder and dipping to the base cuttings in the powder then lightly shaking to remove excess chemical (**PDBC**), (2) Liquid (Dipping basal of cuttings) application, IBA mixed with a carrier (water) and are dipping the base of cuttings for 5-10s at a depth of 2-2.5 cm (**LDBC**), (3) Liquid (Foliar spray) application, IBA mixed with a carrier (water) and cuttings were sprayed to the drip point after insertion with water using a plastic hand spray bottle (**LFS**). Different applications and concentrations of IBA phenomenon in Table (1).

**Table (1)** Different applications and concentrations of IBA.

Indole Butyric Acid (IBA)					
Applications Technique	PPM				
Powder (Dipping basal of cuttings) ( <b>PDBC</b> )	0.0 (Control)	500	1000	1500	2000
Liquid (Dipping basal of cuttings) ( <b>LDBC</b> )					
Liquid (Foliar spray) ( <b>LFS</b> )					

Morphometric Measurements: Rooting percentage (%), Roots number/ plant, Root length (cm/ plant), Root fresh weight (g/plant) and Root dry weight (g/plant), Data were recorded after 21 and 28 days at incubation period (I.P.) after IBA applications. The analysis of variance was performed for data using the method outlined by (**Snedecor and Cochran, 1972**) and the means were compared using L.S.D. test.

## 3. Results and Discussion

Fig.(1&2) Rooting percentage (%), the lowest values were recorded during different incubation periods (21 & 28 days) with control treatment compared to the rest of treatments, it were (16.6 & 33.0 %, sequentially). (**LDBC**) and (**LFS**) applications of IBA at (1000,1500 & 2000 ppm) produced greater rooting percentage (100%) with two terms incubation. While, (**PDBC**) hadn't effect on root promotion compared with other applications with two terms incubation and increasing IBA concentrations, there was an increase in the rooting percentage gradually, as was to increase the incubation periods positive effect to increase rooting percentage. From this it is clear that, (**LFS**) better and easier than (**LDBC**) application, although equal to the rooting percentage in for both.

Fig. (3) The highest significant values of roots number / plant were recorded with two applications of

IBA 2000 ppm under different incubation periods (21 & 28 days), it were (130 & 127.0 /plant, sequentially) with (**LDBC**), and (120 & 130/plant, sequentially) with (**LFS**) applications., while control treatments (free IBA) was recorded the lowest significant value of roots number / plant compared with other treatments. There is a relationship between IBA concentrations and incubation periods with different applications of IBA as follow, (**PDBC**) and (**LFS**) applications at IBA 500 ppm didn't caused positive results with two terms incubation., while the use of both the concentrations of IBA 1000, 1500 & 2000 ppm event difference in (**PDBC**) application also 500 & 1000 ppm was recorded the same results with (**LDBC**) application, as with the rest of treatments were not there positive significant results with two terms incubation.

Fig.(4) Root length (cm/plant), (**LFS**) at IBA 2000 ppm after 21 days of I.P., outperformed significantly in giving a significant increase in root length (10.0 cm / plant) compared with other IBA treatments in the same I.P., while in 28 days of I.P. showed that, IBA 1500 ppm with (**PDBC**), 1000, 1500 and 2000 ppm with (**LDBC** and **LFS**) applications have caused significant increase value in root length. Given the influence of incubation periods within each treatment explained that, Different incubation periods,

didn't caused significant increase except for (PDBC) at IBA 2000 ppm. application at IBA 1500 ppm and (LDBC) application

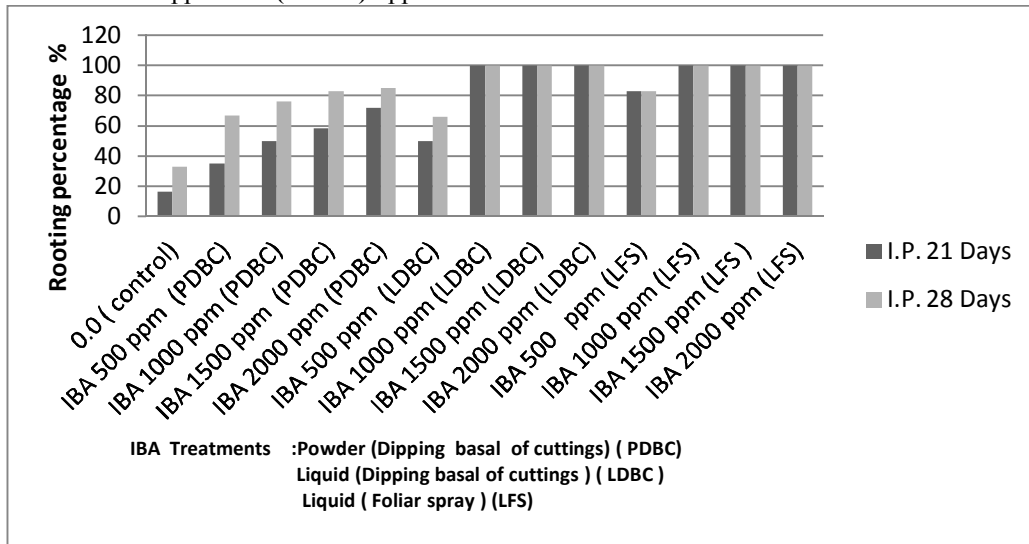


Fig. (1) Effect of different (applications and concentrations of IBA) and incubation periods on rooting percentage of *Petunia hybrida* plant (Combined analysis of 2012/2013 and 2013/2014).



Fig. (2) Effect of different IBA levels at (LFS) on rooting percentage of *Petunia hybrida* Plant.

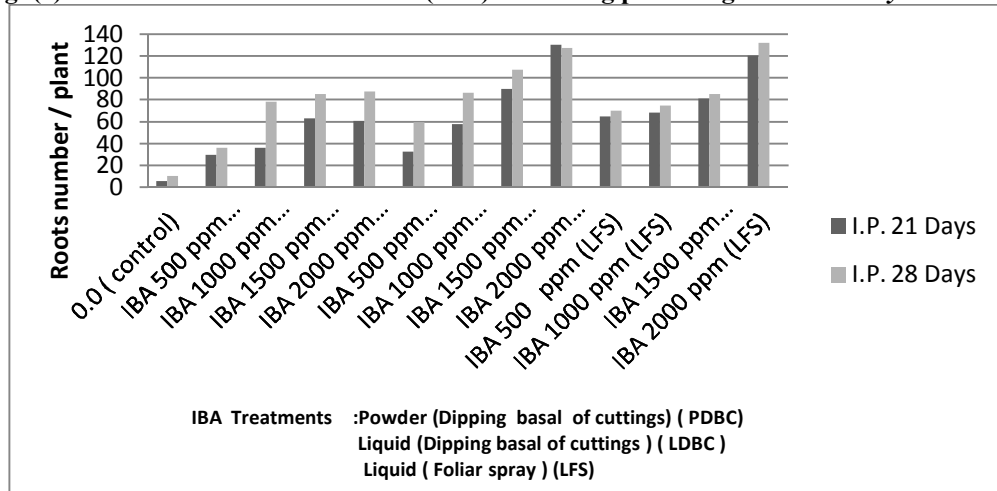
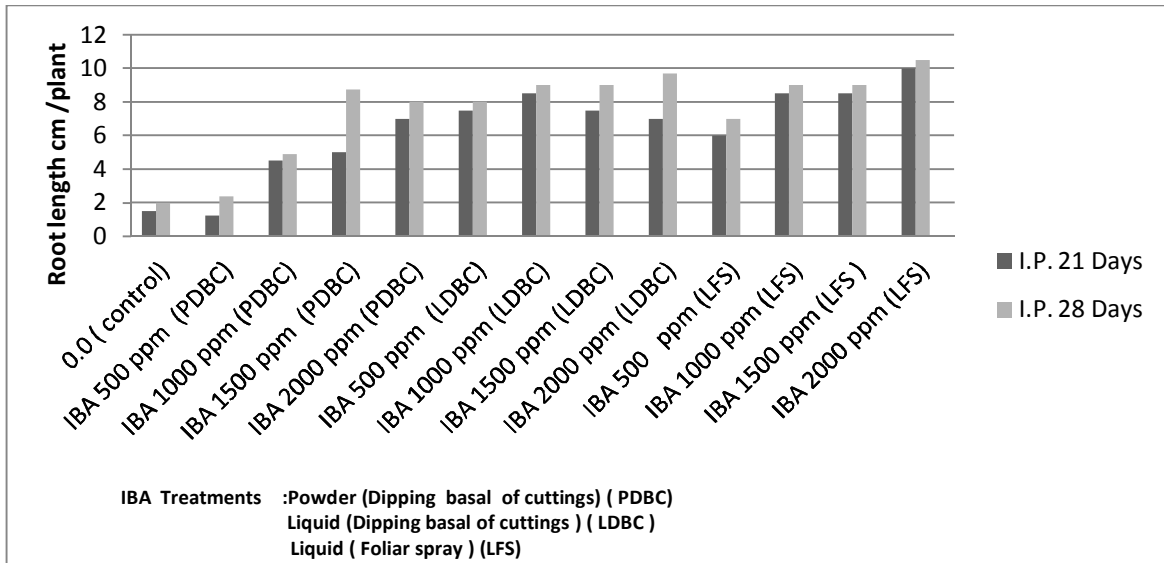


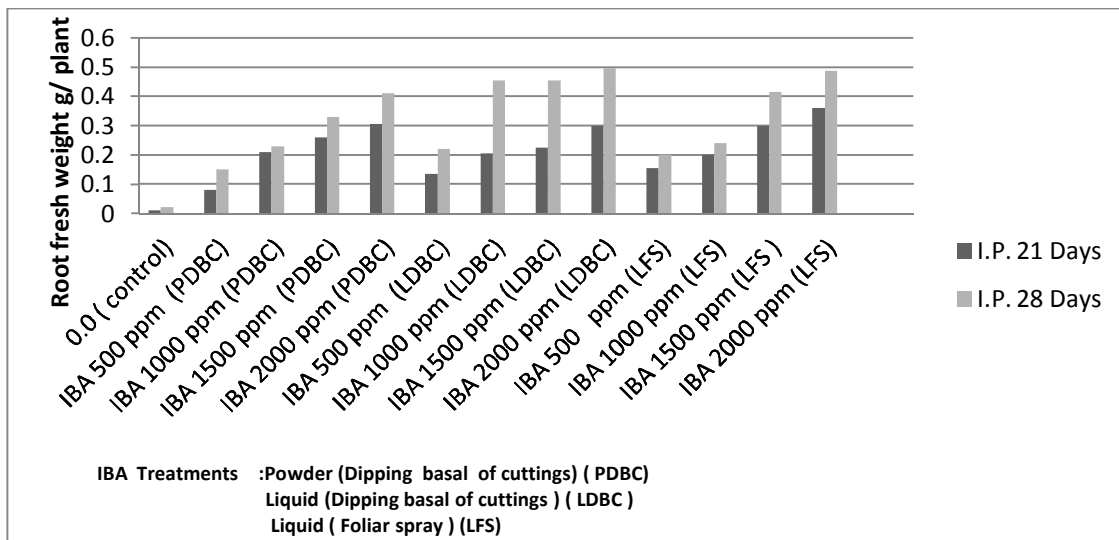
Fig. (3) Effect of different (applications and concentrations of IBA) and incubation periods on roots number / plant of *Petunia hybrida* plant, (Combined analysis of 2012/2013 and 2013/2014). L.S.D.at 0.05 (16.2).



**Fig. (4) Effect of different (applications and concentrations of IBA) and incubation periods on root length cm/ plant of *Petunia hybrid* plant, (Combined analysis of 2012/2013 and 2013/2014). L.S.D.at 0.05 (1.8)**

Fig.(5) Root fresh weight (g/plant), was recorded insignificant values in control treatments (IBA free) and IBA 500 ppm with different applications. In the same trend, 21 days I. P. was recorded the same result.

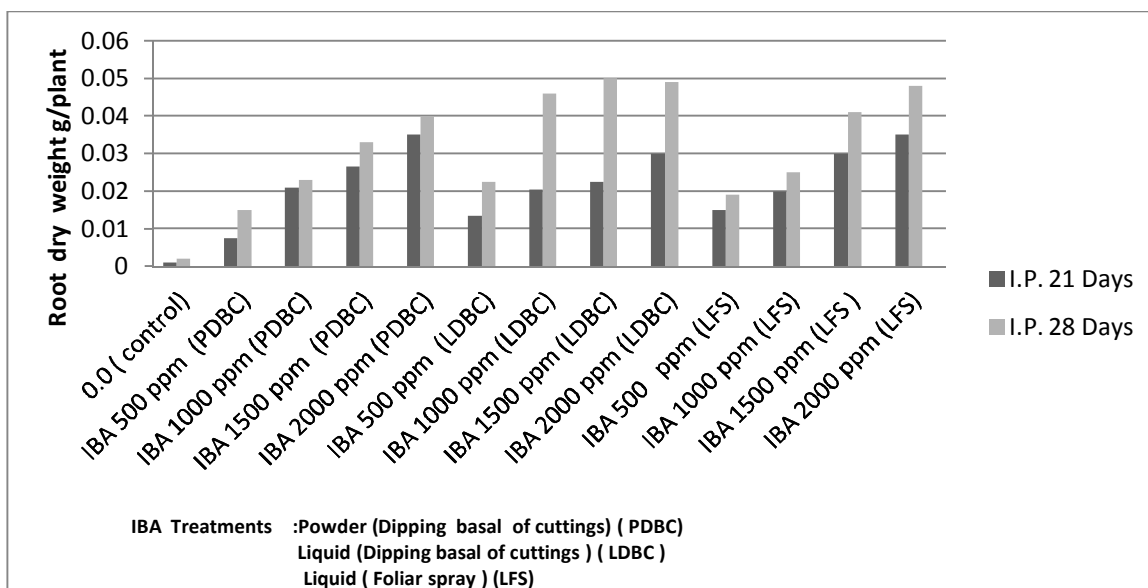
In the second incubation periods 28 days (LDBC) application at IBA 1000, 1500 & 2000 ppm and (LFS) application at 2000 ppm were recorded the highest significant values in fresh weight g / plant.



**Fig. (5) Effect of different (applications and concentrations of IBA) and incubation periods on root fresh weight g / plant of *Petunia hybrida*, (Combined analysis of 2012/2013 and 2013/2014). L.S.D.at 0.05 (0.07).**

Fig.(6) Root dry weight (g/plant),the results indicate that the, All data taken in the first incubation period after 21 days was recorded insignificant value at all treatments. In the same trend. The control treatment, as well as all applications with IBA 500 ppm was recorded worthless results. From another point of view,

highest significant values of dry weight were recorded with data taken in the second incubation period which after 28 days from sowing as follow: IBA 1000 ppm with (LDBS), IBA 1500 ppm with (LDBC and LFS) and IBA 2000 ppm with (PDBC, LDBC and LFS) applications.



**Fig.(6) Effect of different (applications and concentrations of IBA) and incubation period on root dry weight g/plant of *Petunia hybrida*, (Combined analysis of 2012/2013 and 2013/2014). L.S.D.at 0.05 (0.012).**

(Davies, 2004) Reported that, root formation effects of auxins: cell enlargement (increase root and stem length), cell division (assists in root formation), root initiation (induce roots on stem and sometimes leaves), and apical dominance (effects the stem and leaf growth when using foliar applied auxins). Plant transport IAA and other auxins, cell to cell, to the basal end. the plant regulators the speed of motion based upon physiological factors. such as water status. relative rates of movement are IAA at 7.5 mm/hr., NAA at 6.7 mm/hr. and IBA at 3.2 mm/ hr. the rate of flow is not critical since auxin use is slow (Epstein, 1993). As the auxins travel they accumulate in higher concentrations at the basal end., tow physiologically distance and spatially separated pathway function to transport auxin free auxin move in the primary shoot through the epidermis, bundle sheath, vascular meristem, and xylem (Thimann, 1977). (Eugene et al., 2004) Pointed out that, a foliar application of auxin after the cuttings have been inserted has the potential of being incorporated into mechanized production processes and reducing the number of employees who must work with chemicals. Leaves have stomata, pores that allow the plant to transpire gases, oxygen and carbon oxidase, and liquids. The stomata are protected, each by to guard cells. These cells cause the stomata to be open during normal room temperature and close in heat or cold. Under the guard cells are air spaces. aqueous auxin solutions contain (free auxins) the solutions when applied to leaves, enter open stomata and are entrapped in the air space. After entry free auxin can flow through the vascular system (Leopold, 1955).

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