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# EFFECT OF NITROGEN FERTILIZATION AND GROWTH REGULATORS ON *DELONIX REGIA* SEEDLINGS GROWN IN SANDY SOIL

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**ABSTRACT**: A pot experiment was carried out at the Fac. of Agric. Nursery, Minia Univ. to explore the response of *Delonix regia* seedlings to three nitrogen fertilization rates (10, 20 and 30 g/plot of ammonium sulphate (20.5 % N) and seven growth regulator treatments (0, $GA_3$ at 50, 100 and 150 ppm and IAA at 25, 50 and 75 ppm).

The studied vegetative growth characters (plant height, stem thickness, crown diameter, number of leaves and dry weight of leaves, stem and roots) were gradually increased parallel to the increase in N fertilization rate. A similar trend, in response to N fertilization was observed for total chlorophylls content (a + b) and nitrogen % in the leaves. Concerning growth regulators, both $GA_3$ and IAA effectively induced different vegetative growth traits and chemical determinations, except, for stem thickness, total chlorophylls and N % which were reduced due to $GA_3$. The effectiveness of either $GA_3$ or IAA was parallel to its concentration. The best growth of *Delonix regia* seedlings was achieved by supplying the plants with the high N fertilization rate (30 g/pot) along with either $GA_3$ at 150 ppm or IAA at 75 ppm.

**Key words:** *Delonix regia*, nitrogen fertilization, growth regulator, vegetative growth, chlorophylls content.

## INTRODUCTION

Planting suitable, nice-looking, extending canopy, long-last flowering of ornamental shade trees along the roads, streets and avenues, in addition to their use in public gardens and parking lots is extensively needed. One of the most popular and widely cultivated shady and ornamental trees in Egypt is *Delonix regia* (royal poinciana). It is a rapid-growing, medium-sized deciduous tree characterized with ideal horizontal canopy branching, vegetative coverage with showy large red flowers from early summer to late autumn.

Many authors insured the role of nitrogen fertilization in augmenting the different vegetative growth aspects, photosynthetic pigments and/or N % such as Ali *et al.* (2002), Ahmed *et al.* (2005), Booth (2008); Havilckova (2009) and Balasus *et al.* (2010) on poplar; Abdou and El-Sayed (2002) on *Peltophorum africanum*; Soliman (2005) on *Khaya senegalensis*; El-Morshedy (2007) on *Grevillea robusta*; Moustafa (2008) on *Chorisia speciosa* and Osman and Abo hassan (2010) on mangrove. However, that of $GA_3$ was reported by Ahmed (1998) on *Robinia pseudoacacia*; Ahmed and Aly (1998) and Mohammad (2003) on *Acacia saligna*; Sayed (2001) on *Khaya senegalensis*; Abdou (2001) on *Jacaranda ovalifolia*; Badran *et al.* (2006a and 2006b) on jojoba and Ibrahim (2007) on *Koelreuteria paniculata*. Meanwhile, that of IAA was revealed by Taha (1994) on

*Parkinsonia aculeata*. Nanda *et al.* (1996) and Zaky (2003) on *Hibiscus rosa-sinensis*; El-Sallami and Mahrous (2000) on poinsettia; Abdou (2001) on *Jacaranda ovalifolia*; Badran *et al*. (2003) on *Acacia saligna* and Ibrahim (2007) on *Koelreuteria paniculata*.

The goal of this experiment was to determine the response of *Delonix regia* seedlings, grown in sandy soil, to N fertilization rate and $GA_3$ and IAA concentrations.

## MATERIALS AND METHODS

This trial was conducted at the Nursery of Fac. of Agric., Minia Univ. during 2016 and 2017 successive seasons to explore the response of *Delonix regia* seedlings to 3 nitrogen fertilization rates (10, 20 and 30 g/pot of ammonium sulphate (20.5 % N %) and seven growth regulator treatments (0, $GA_3$ at 50, 100 and 150 ppm and IAA at 25, 50 and 75 ppm).

One year old seedlings (average of 80 cm height and 8 mm thickness) were planted in 30 cm clay pots filled with 12 kg of sandy soil on the first week of March 2016 and 2017 for both seasons. A complete randomized block design in split plot arrangement with four replicates and five plants/replicate was followed in this trial where the three N fertilization rates represent the main plots and the seven growth regulator treatments represent the sub-plots.

Amounts of nitrogen fertilizer were divided into four equal batches and added two months from planting date with four weeks interval. Concerning growth regulator treatments, they were foliar sprayed three months after planting date and repeated four times with three weeks interval. In addition, each plant was supplied with 10 g calcium superphosphate 15.5 % $P_2O_5$ and 5 g potassium sulphate 48 % $K_2O$, which were divided into two equal batches and added with the first and second additions of nitrogen fertilization.

At the end of the experiment on the first week of October 2016 and 2017, data were recorded for plant height (cm), stem thickness (10 cm above soil surface), crown diameter, number of leaves/plant and dry weight of leaves, stem and roots/plant. In addition, total chlorophylls content (mg/g. f.w.) and nitrogen % in the leaves were determined according to Fadl and Seri-Eldeen (1978) and Page *et al.* (1982), respectively. Obtained data were tabulated and statistically analyzed following the L.S.D. method expressed by Little and Hill (1978).

## RESULTS AND DISCUSSION

### Vegetative growth characters:

The different vegetative growth traits included in the present experiment, plant height, stem thickness, crown diameter, number of leaves and dry weight of leaves, stem and roots were gradually increased parallel to the gradual increase in nitrogen fertilization rate, in both seasons as illustrated in Tables (1, 2 and 3).

**Table a. Physical and chemical analysis of the used soil.**

| Properties | Values | Properties | | Values |
|---|---|---|---|---|
| **Sand (%)** | 91.0 | **P mg/100 (g)** | | 3.90 |
| **Silt (%)** | 5.8 | **Exchangeable $K^+$ mg/100 g soil** | | 0.20 |
| **Clay (%)** | 3.2 | | **Fe** | 1.20 |
| **Organic matter (%)** | 0.08 | **DTPA** | **Cu** | 0.43 |
| **$CaCO_3$ (%)** | 12.7 | **Ext. (ppm)** | **Zn** | 0.21 |
| **pH (1:2.5)** | 8.15 | | **Mn** | 0.40 |
| **E.C. mmhose/cm** | 1.09 | | | |
| **Total N (%)** | 0.02 | | | |

**Table 1. Effect of N fertilization and growth regulators on some vegetative growth traits of *Delonix regia* seedlings during 2016 and 2017 seasons.**

| Growth regulator treatments (B) | Nitrogen fertilization levels (g/pot) (A) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1st season (2016) | | | | 2nd season (2017) | | | |
| | 10 | 20 | 30 | Mean (B) | 10 | 20 | 30 | Mean (B) |
| **Plant height (cm)** | | | | | | | | |
| Control | 110.4 | 114.7 | 117.6 | 114.2 | 119.5 | 123.7 | 127.2 | 123.5 |
| $GA_3$ 50 | 120.2 | 125.8 | 130.1 | 125.4 | 132.0 | 134.5 | 141.3 | 135.9 |
| $GA_3$ 100 | 130.1 | 137.3 | 142.3 | 136.6 | 143.5 | 146.7 | 153.2 | 147.8 |
| $GA_3$ 150 | 151.8 | 160.1 | 165.1 | 159.0 | 156.3 | 160.6 | 167.5 | 161.5 |
| IAA 25 | 115.2 | 120.5 | 123.9 | 119.9 | 122.5 | 129.2 | 133.2 | 128.3 |
| IAA 50 | 119.0 | 125.4 | 130.3 | 124.9 | 129.1 | 136.4 | 139.0 | 134.8 |
| IAA 75 | 123.7 | 130.4 | 133.8 | 129.3 | 136.0 | 143.2 | 145.2 | 141.5 |
| Mean (A) | 124.3 | 130.6 | 134.7 | | 134.1 | 139.2 | 143.8 | |
| L.S.D. at 5 % | A: 7.8 | B: 12.9 | AB: 22.3 | | A: 8.8 | B: 13.5 | AB: 23.4 | |
| **Stem thickness (mm)** | | | | | | | | |
| Control | 11.4 | 11.9 | 12.6 | 12.0 | 12.2 | 13.0 | 13.8 | 13.0 |
| $GA_3$ 50 | 10.9 | 11.4 | 11.9 | 11.4 | 11.3 | 11.8 | 12.4 | 11.8 |
| $GA_3$ 100 | 10.6 | 11.1 | 11.5 | 11.1 | 10.6 | 11.3 | 11.7 | 11.2 |
| $GA_3$ 150 | 10.0 | 10.5 | 11.3 | 10.6 | 10.3 | 10.7 | 11.4 | 10.8 |
| IAA 25 | 11.8 | 12.3 | 12.9 | 12.3 | 13.0 | 14.0 | 14.6 | 13.9 |
| IAA 50 | 12.3 | 12.8 | 13.4 | 12.8 | 13.5 | 14.6 | 15.5 | 14.5 |
| IAA 75 | 12.7 | 13.2 | 13.8 | 13.2 | 14.3 | 15.0 | 15.7 | 15.0 |
| Mean (A) | 11.4 | 11.9 | 12.5 | | 12.2 | 12.9 | 13.7 | |
| L.S.D. at 5 % | A: 0.8 | B: 1.0 | AB: 1.7 | | A: 0.7 | B: 1.1 | AB: 1.9 | |
| **Crown diameter (m)** | | | | | | | | |
| Control | 1.49 | 1.60 | 1.78 | 1.62 | 1.60 | 1.71 | 1.81 | 1.71 |
| $GA_3$ 50 | 1.96 | 2.11 | 2.32 | 2.13 | 2.15 | 2.22 | 2.40 | 2.26 |
| $GA_3$ 100 | 2.03 | 2.19 | 2.42 | 2.22 | 2.24 | 2.34 | 2.50 | 2.36 |
| $GA_3$ 150 | 2.15 | 2.31 | 2.60 | 2.35 | 2.35 | 2.39 | 2.60 | 2.45 |
| IAA 25 | 1.79 | 1.88 | 1.96 | 1.88 | 1.80 | 1.85 | 2.11 | 1.92 |
| IAA 50 | 1.86 | 1.90 | 2.08 | 1.95 | 1.90 | 1.96 | 2.20 | 2.02 |
| IAA 75 | 2.02 | 2.13 | 2.39 | 1.18 | 2.03 | 2.15 | 2.39 | 2.19 |
| Mean (A) | 1.90 | 2.02 | 2.22 | | 2.01 | 2.09 | 2.29 | |
| L.S.D. at 5 % | A: 0.12 | B: 0.17 | AB: 0.29 | | A: 0.10 | B: 0.12 | AB: 0.20 | |

**Table 2. Effect of N fertilization and growth regulators on some vegetative growth traits of *Delonix regia* seedlings during 2016 and 2017 seasons.**

| Growth regulator treatments (B) | Nitrogen fertilization levels (g/pot) (A) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1st season (2016) | | | | 2nd season (2017) | | | |
| | 10 | 20 | 30 | Mean (B) | 10 | 20 | 30 | Mean (B) |
| **Number of leaves/plant (g)** | | | | | | | | |
| **Control** | 60.4 | 64.1 | 66.3 | 63.6 | 66.0 | 69.3 | 72.5 | 69.3 |
| **$GA_3$ 50** | 70.1 | 76.2 | 80.4 | 75.6 | 75.3 | 80.3 | 85.4 | 80.3 |
| **$GA_3$ 100** | 80.2 | 88.6 | 92.2 | 87.0 | 86.3 | 93.2 | 98.5 | 92.7 |
| **$GA_3$ 150** | 100.8 | 110.5 | 114.0 | 108.4 | 104.4 | 110.2 | 115.4 | 110.0 |
| **IAA 25** | 86.4 | 90.8 | 94.7 | 90.6 | 92.3 | 97.3 | 98.6 | 96.1 |
| **IAA 50** | 90.1 | 94.5 | 100.6 | 95.1 | 94.3 | 98.6 | 100.7 | 97.9 |
| **IAA 75** | 94.9 | 100.3 | 104.8 | 100.0 | 97.6 | 102.4 | 105.3 | 101.8 |
| **Mean (A)** | 83.3 | 89.3 | 93.3 | | 88.0 | 93.1 | 96.7 | |
| **L.S.D. at 5 %** | A: 4.8 | B: 7.7 | AB: 13.3 | | A: 4.8 | B: 8.8 | AB: 15.2 | |
| **Leaves dry weight/plant (g)** | | | | | | | | |
| **Control** | 57.8 | 62.0 | 63.7 | 61.2 | 60.2 | 63.4 | 68.0 | 63.8 |
| **$GA_3$ 50** | 59.6 | 64.2 | 67.3 | 63.7 | 66.6 | 68.3 | 71.3 | 68.7 |
| **$GA_3$ 100** | 65.2 | 70.7 | 73.3 | 69.7 | 73.2 | 78.0 | 78.7 | 76.6 |
| **$GA_3$ 150** | 70.1 | 76.7 | 78.5 | 75.1 | 80.6 | 84.0 | 84.1 | 82.9 |
| **IAA 25** | 72.6 | 76.4 | 79.1 | 76.1 | 75.3 | 80.5 | 81.7 | 79.2 |
| **IAA 50** | 75.7 | 79.5 | 83.9 | 79.7 | 76.8 | 82.0 | 85.4 | 81.4 |
| **IAA 75** | 78.4 | 85.0 | 85.6 | 83.0 | 79.7 | 85.8 | 88.0 | 84.5 |
| **Mean (A)** | 68.5 | 73.5 | 75.9 | | 73.2 | 77.4 | 79.6 | |
| **L.S.D. at 5 %** | A: 4.0 | B: 6.3 | AB: 10.8 | | A: 4.1 | B: 6.1 | AB: 10.5 | |
| **Stem dry weight/plant (g)** | | | | | | | | |
| **Control** | 22.3 | 26.8 | 28.4 | 25.8 | 22.7 | 28.3 | 31.5 | 27.5 |
| **$GA_3$ 50** | 25.1 | 30.1 | 32.4 | 29.2 | 26.7 | 31.7 | 34.4 | 31.0 |
| **$GA_3$ 100** | 27.2 | 31.7 | 32.9 | 30.6 | 31.7 | 34.6 | 37.1 | 34.4 |
| **$GA_3$ 150** | 30.5 | 34.7 | 36.1 | 33.8 | 32.3 | 36.9 | 39.9 | 36.4 |
| **IAA 25** | 27.4 | 32.7 | 33.5 | 31.2 | 29.1 | 35.0 | 35.5 | 33.2 |
| **IAA 50** | 30.6 | 33.4 | 34.8 | 32.9 | 31.8 | 35.7 | 37.1 | 34.9 |
| **IAA 75** | 31.1 | 35.7 | 37.2 | 34.7 | 32.1 | 36.1 | 38.4 | 35.8 |
| **Mean (A)** | 27.7 | 32.2 | 33.6 | | 29.5 | 34.0 | 36.3 | |
| **L.S.D. at 5 %** | A: 3.0 | B: 4.6 | AB: 8.0 | | A: 3.1 | B: 4.1 | AB: 7.1 | |

**Table 3. Effect of N fertilization and growth regulators on roots dry weight/plant, total chlorophylls content and leaves nitrogen percentage of *Delonix regia* seedlings during 2016 and 2017 seasons.**

| Growth regulator treatments (B) | Nitrogen fertilization levels (g/pot) (A) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1st season (2016) | | | | 2nd season (2017) | | | |
| | 10 | 20 | 30 | Mean (B) | 10 | 20 | 30 | Mean (B) |
| | **Roots dry weight/plant (g)** | | | | | | | |
| **Control** | 109 | 115 | 119 | 114 | 118 | 123 | 128 | 123 |
| **$GA_3$ 50** | 116 | 127 | 131 | 125 | 134 | 140 | 144 | 139 |
| **$GA_3$ 100** | 129 | 134 | 136 | 133 | 140 | 146 | 152 | 146 |
| **$GA_3$ 150** | 137 | 139 | 140 | 141 | 145 | 152 | 158 | 152 |
| **IAA 25** | 138 | 141 | 144 | 141 | 147 | 152 | 156 | 152 |
| **IAA 50** | 141 | 144 | 146 | 144 | 151 | 161 | 162 | 158 |
| **IAA 75** | 146 | 151 | 152 | 150 | 154 | 168 | 170 | 164 |
| **Mean (A)** | 131 | 136 | 138 | | 142 | 149 | 153 | |
| **L.S.D. at 5 %** | A: 6 | B: 13 | AB: 23 | | A: 9 | B: 14 | AB: 25 | |
| | **Total chlorophylls content (a + b) (mg/g f.w.)** | | | | | | | |
| **Control** | 2.94 | 3.35 | 3.73 | 3.34 | 3.02 | 3.18 | 3.37 | 3.19 |
| **$GA_3$ 50** | 2.91 | 3.21 | 3.57 | 3.23 | 2.99 | 3.11 | 3.22 | 3.11 |
| **$GA_3$ 100** | 2.78 | 3.06 | 3.41 | 3.08 | 2.96 | 3.06 | 3.12 | 3.04 |
| **$GA_3$ 150** | 2.53 | 2.81 | 3.08 | 2.80 | 2.92 | 2.97 | 3.02 | 2.97 |
| **IAA 25** | 3.04 | 3.47 | 3.85 | 3.45 | 3.05 | 3.21 | 3.31 | 3.19 |
| **IAA 50** | 3.14 | 3.58 | 4.04 | 3.57 | 3.09 | 3.27 | 3.37 | 3.24 |
| **IAA 75** | 3.25 | 3.70 | 4.16 | 3.70 | 3.12 | 3.35 | 3.45 | 3.31 |
| **Mean (A)** | 2.94 | 3.31 | 3.69 | | 3.01 | 3.16 | 3.27 | |
| **L.S.D. at 5 %** | A: 0.21 | B: 0.26 | AB: 0.45 | | A: 0.13 | B: 0.18 | AB: 0.31 | |
| | **Leaves nitrogen percentage** | | | | | | | |
| **Control** | 2.73 | 2.86 | 2.92 | 2.84 | 2.23 | 2.26 | 2.31 | 2.27 |
| **$GA_3$ 50** | 2.64 | 2.84 | 2.89 | 2.79 | 2.11 | 2.22 | 2.26 | 2.20 |
| **$GA_3$ 100** | 2.58 | 2.73 | 2.81 | 2.71 | 1.99 | 2.05 | 2.14 | 2.06 |
| **$GA_3$ 150** | 2.41 | 2.71 | 2.78 | 2.63 | 1.73 | 1.88 | 2.05 | 1.89 |
| **IAA 25** | 2.78 | 2.89 | 2.94 | 2.87 | 2.31 | 2.42 | 2.47 | 2.40 |
| **IAA 50** | 2.81 | 2.90 | 2.96 | 2.89 | 2.38 | 2.50 | 2.56 | 2.48 |
| **IAA 75** | 2.86 | 2.93 | 2.98 | 2.92 | 2.43 | 2.55 | 2.60 | 2.53 |
| **Mean (A)** | 2.69 | 2.84 | 2.90 | | 2.17 | 2.27 | 2.34 | |
| **L.S.D. at 5 %** | A: 0.15 | B: 0.17 | AB: N.S. | | A: 0.11 | B: 0.13 | AB: N.S. | |

Moreover, the high fertilization rate (30 g/pot) gave the significantly highest values than the low one (10 g/pot), for all seven examined parameters. In agreement with these results were the findings of Ali *et al*. (2002), Ahmed *et al.* (2005), Booth (2008), Havilackova (2009), Balasus *et al.* (2010) on poplar; Abdou and El-Sayed (2002) on *Peltophorum africanum*; Soliman (2005) on *Khaya senegalensis*; El-Morshedy (2007) on *Grevillea robusta* and Moustafa (2008) on *Chorisia speciosa*.

Concerning growth regulators, all of the prementioned growth traits, except for stem thickness were gradually increased due the gradual increase in the concentration of either $GA_3$ or IAA in comparison with control treatment in the two seasons, (Tables 1, 2 and 3). Significant differences were obtained with the high concentration (150 ppm for $GA_3$ and 75 ppm for IAA) giving the best results. Stem diameter, on the other hand, was reduced by $GA_3$ but increased by IAA. In accordance with these findings regarding $GA_3$ were those reported by Ahmed (1998); Ahmed and Aly (1998), Sayed (2001), Abdou (2001), Badran *et al*. (2006a) and Ibrahim (2007) on *Robinia pseudoacacia*, *Acacia saligna*; *Khaya senegalensis*, *Jacaranda ovalifolia*, jojoba and *Koelreuteria paniculata*, respectively. The role of IAA in enhancing the different vegetative growth characters was revealed by Nanda *et al.* (1996) and Zaky (2003) on *Hibiscuss rosa-sinensis,* El-Sallami and Mahrous (2000) on poinsettia, Abdou (2001) on *Jacaranda ovalifolia*, Badran *et al.* (2003) on *Acacia saligna* and Ibrahim (2007) on *Koelreuteria paniculata*.

The interaction between N fertilization and growth regulator treatments was significant for all seven growth characters, with the best overall results being obtained due to the high N rate (30 g/pot) in combination with either the high $GA_3$ or IAA concentration (150 or 75, respectively) as shown in Tables (1, 2 and 3).

**Chemical composition:**

Total chlorophylls content and nitrogen % in the leaves were promoted upward by the gradual increase in N fertilization rate with the high rate (30 g/pot) giving the highest values, in both seasons, which were significantly better than the low rate, (Table, 3). Similar results were given by Abdou and El-Sayed (2002), Soliman (2005), El-Morshedy (2007), Moustafa (2008) and Osman and Abohassan (2010) on *Peltophorum africanum*, *Khaya senegalensis*, *Grevillea robusta*, *Chorisia speciosa* and mangrove respectively, concerning chlorophylls content. However, Ali *et al.* (2002), Ahmed *et al*. (2005) and Balasus *et al*. (2010) on popular; Soliman (2005) on *Khaya senegalensis* and Moustafa (2008) on *Chorisia speciosa* insured the role of N fertilization in increasing leaves N %.

Table (3) illustrates that both chlorophylls content and nitrogen % were decreased by $GA_3$ but increased by IAA application. Such reduction and promotion was gradual parallel to the increase in the concentration of either growth regulator in the two seasons. Different authors such as Ahmed (1998) on *Robinia pseudoacacia*; Ahmed and Aly (1998) and Mohammed (2003) on *Acacia saligna*; Badran *et al.* (2006b) on jojoba and Ibrahim (2007) on *Koelreuteria paniculata* pointed out that chlorophylls content and N % were decreased due to $GA_3$ application. Our results concerning the promotive influence of IAA on chlorophylls and N % were in agreement with those of Taha (1994), Abdou (2001), Zaky (2003), Badran *et al.* (2003) and Ibrahim (2007) on *Parkinsonia aculeate*, *Jacaranda ovalifolia*, *Hibiscus rosa-sinensis*, *Acacia saligna* and *Koelreuteria paniculata*, respectively.

The interaction between N fertilization and growth regulator treatments was significant for leaves N % in both seasons with the best results being obtained due to the high N rate in combination with the high IAA concentration as shown in Table (3).

The role of nitrogen fertilization in stimulating the different aspects of vegetative growth and chemical constituents are due to its essentiality as a constituent of the protoplasm. More available nitrogen supply would allow the meristematic system to be more active, consequently, stimulating plant height and diameter and increasing fresh and dry weights of leaves, stem and roots, (Devlin, 1975). Concerning $GA_3$ and IAA, both are among the naturally occurring plant growth hormones as Weier *et al.* (1974) demonstrated that gibberellins control stem elongation through effects on both cell division and cell elongation in the subapical region. They also promote the synthesis of special enzymes, induce flowering and overcome dormancy. Kramer and Kozlowski (1960) mentioned that indole acetic acid causes elongation of shoot cells, stimulates cambial activity, causes initiation of root primordia and formation of callus tissues.

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## تأثير التسميد النتروجيني ومنظمات النمو على شتلات البوانسيانا النامية في الأراضي الرملية

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تم إجراء تجربة أصص بغرض التعرف على إستجابة شتلات البوانسيانا لثلاثة معدلات من التسميد النتروجيني (١٠، ٢٠، ٣٠ جرام سلفات الأمونيوم للأصص) وسبعة معاملات لمنظمات النمو (كنترول وحمض جبريليك بتركيزات ٥٠، ١٠٠، ١٥٠ جزء في المليون وإندول حامض الخليك بتركيزات ٢٥، ٥٠، ٧٥ جزء في المليون).

حدثت زيادة تدريجية في الصفات الخضرية تحت الدراسة وهي طول النبات وسمك الساق وقطر التاج وعدد الأوراق والوزن الجاف للأوراق والساق والجذور تبعا للزيادة في معدل التسميد النتروجيني وقد وجد نفس الإتجاه كإستجابة للتسميد النتروجيني فيما يختص بالكلوروفيلات الكلية ونسبة النتروجين في الأوراق. وفيما يتعلق بمنظمات النمو فقد حدثت زيادة في كل الصفات الخضرية والتقديرات الكيماوية نتيجو استعمال حامض الجبريليك واندول حامض الخليك ، فيما عدا صفة سمك الساق ومجموع الكلوروفيلات ونسبة النتروجين والتي إنخفضت نتيجت إستعمال حامض الجبريليك. ولقد لوحظ أن كفاءة كل من منظمي النمو كانت تزداد بإزدياد التركيز. ولقد تم الوصول لأفضل نمو من شتلات البوانسيانا نتيجة إمداد تلك الشتلات بالمعدل العالي من التسميد النتروجيني (٣٠ جرام/للإصيص) مع إستعمال حاض الجبريليك بتركيز ١٥٠ جزء/مليون أو إندول حامض الخليك بتركيز ٧٥ جزء/مليون.