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# GROWTH ACCELERATION IN *CITRUS LATIPES* ROOT STOCK SEEDLINGS BY FOLIAR APPLICATION OF GIBBERELLIC ACID AND UREA

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Many times growth of rootstock seedlings after transplanting is poor because of many reasons and has to discard such seedlings for budding, quantity of which may be to the extent of 20%-30% (Srivastava and Nanaih, 1972). This may cause an economical loss to the grower. The thickness of girth of rootstocks is one of the criteria to judge the seedlings for budding. Thinner wood has comparatively lower number of translocation vessels per unit area. Size of vessels was significantly larger in thicker wood ( Ghosh and Chattopadhyay, 1972). Thinner wood also having contrasting situation may hamper translocation of nutrients. Kulwal (1991) reported that success of budding is related to shoot growth. Gibberellins are known to enhance growth of plants. Their main effect is that they are responsible for tallness. The stem of a tall plant contains more biologically active Gibberellins than does the stem of a dwarf plant (Lincolntaiz and Zeiger, 1991). Many worker had reported that plant growth was enhanced by Gibberellins in citrus (Prasad and Singh, 1980, Alluwar et al., 1997, Dalal et al., 1999). No efforts have been made to enhance the growth of Citrus latipes by use of plant growth regulation and nutrients.

Hence enhancement of growth of such rootstocks after transplanting by use of plant growth regulators and nutrients is desired. Therefore, an attempt has been made to see the effect of $GA_3$ and urea on growth of Citrus latipes.

The experiment was conducted at ICAR Research Complex for NEH Region, Umiam, Meghalaya during 2000-2001 on seedlings of Citrus latipes rootstocks for growth acceleration. The treatments were replicated five times in Randomized block design keeping 40 plants in each replication. The $GA_3$ was applied at the rate of 0 ppm, 10 ppm, 30ppm, 50ppm and 100ppm whereas, urea was sprayed at 0% and 1% concentration. Foliar application was done 30 days after transplanting in secondary nursery. All treatments were given same cultural and plant protection measures. The data were recorded on shoot and root growth after 4-month grower. The leaf area was measured from 5 leaves taken from lower portion of the plant in each replication.

A perusal of the data indicated that GA3 and urea had significant effect on stem girth. Among various treatments, $GA_3$ 30 ppm + 1% urea increased stock girth significantly over control, which was at par with $GA_3$ 50 ppm + 1% urea, $GA_3$10 ppm + 1% urea, $GA_3$ 10 ppm and $GA_3$ 30 ppm. The effect of $GA_3$ may be due to increase in the size of the meristematic region and further increase in proportion of cells which are undergoing cell division (Loy, 1977) along with promotion of DNA synthesis in cell in growth phase of cell cycle (Jacqmard, 1968)

Plant height was also significantly influenced by foliar application of $GA_3$ and urea. The application of $GA_3$ 50 ppm had highest plant height (40.60 cm) which did not have significant edge over application of $GA_3$ 30 ppm + 1% urea (37.00) and $GA_3$ 100 ppm(36.40cm). It may be due to gibberellin increases both cell division and cell elongation, because increases in cell number and cell length have been noted (Lincolntaiz and Zeiger, 1991) Dalal et al. (1999) also found same in studies

on growth acceleration in Rangpur lime rootstocks seedlings by foliar application of gibberellic acid and urea.

It is evident from the data leaves per plant, leaf area and internode length were significantly affected by gibberellic acid urea. Maximum leaves per plant (51.20 leaves) was counted when $GA_3$ 50 ppm + 1% urea was applied. Whereas larger size leaf (21.50cm2) and highest length of internode (1.76 cm) was recorded in application of $GA_3$ 30 ppm + 1% urea. Ross et al. (1990) reported that internode length is reduced and leaf growth altered by a reduction in GA3 levels.

Data pertaining to fresh weight and dry weight of shoot indicates significantly influence of GA3 and urea. The highest fresh weight of shoot (20.04g) and dry weight of shoot (7.23 g) was recorded in foliar application of $GA_3$ 50 ppm + 1%urea, which was at par with application of $GA_3$ 50 ppm.

It is evident from Table 2 that root growth was also affected significantly by foliar application of $GA_3$ and urea. The highest length of tape root was found in application of $GA_3$ 30ppm + 1% urea (22.80 cm) which was statistically on par with $GA_3$ 10 ppm +1% urea (21.60 cm), $GA_3$ 10 ppm (21.00 cm) and $GA_3$ 50 ppm + 1% urea (20.60 cm). However root spread was also found to be highest when $GA_3$ applied at 100-ppm concentration along with 1% urea (15.00 cm) and lowest in control (10.60 cm).

Number of secondary root, fresh and dry weight of roots also varied significantly. Amongst different treatments, application of $GA_3$ 50 ppm + 1% urea had highest number of secondary root (52.20) and lowest in $GA_3$ 30 ppm (32.40 cm). Data pertaining to fresh and dry weight of root indicated that maximum fresh weight of roots (11.42 g) and dry weight of roots (3.86 g) were recorded in application of $GA_3$ 50 ppm + 1% urea.

It is concluded that foliar application of gibberellic acid 50 ppm or 30 ppm + 1% urea may be effective to enhance over all growth of seedlings of Citrus latipes rootstocks to make them ideal for seedling.

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Table:1 Effect of Urea and GA3on shoot growth of Citrus latipes

| Treatments | Stern girth (mm) | Plant height (cm) | Leaves per plant ($cm^2$) | Leaf area internode (cm) | Length of of shoot (g) | Fresh weight of shoot (g) | Dry weight |
|---|---|---|---|---|---|---|---|
| Control | 4.40 | 21.20 | 25.80 | 14.40 | 1.14 | 8.32 | 3.37 |
| 1% Urea | 4.64 | 31.40 | 33.60 | 13.60 | 1.38 | 10.76 | 4.39 |
| $GA_3$ 10 ppm+ 0% Urea | 6.26 | 28.00 | 35.80 | 19.50 | 1.48 | 11.36 | 4.07 |
| $GA_3$ 10 ppm + 1% Urea | 6.46 | 26.20 | 36.20 | 21.04 | 1.64 | 11.94 | 4.50 |
| $GA_3$ 30 ppm + 0% Utea | 6.20 | 26.40 | 35.40 | 17.00 | 1.58 | 10.44 | 4.21 |
| $GA_3$ 30 ppm + 1% Urea | 7.04 | 37.00 | 42.20 | 21.50 | 1.76 | 17.38 | 6.45 |
| $GA_3$ 50 ppm + 0% Urea | 6.94 | 40.60 | 42.40 | 18.70 | 1.32 | 19.28 | 6.66 |
| $GA_3$ 50 ppm + 1% Urea | 6.66 | 35.40 | 51.20 | 12.40 | 1.16 | 20.04 | 7.23 |
| $GA_3$ 100 ppm + 0%urea | 6.06 | 36.40 | 39.20 | 11.20 | 1.54 | 14.60 | 5.10 |
| $GA_3$ 100 ppm+ 1% Urea | 5.80 | 31.80 | 48.40 | 12.26 | 1.26 | 15.06 | 5.44 |
| CD at 5% | 1.04 | 5.67 | 3.94 | 2.07 | 0.14 | 0.81 | 0.23 |

Table 2. Effect of Urea and GA3 on Root length, Spread, Fresh and Dry weight of root of Citrus latipes

| Treatments | Length of Tap Root (cm) | Root Spread (cm) | No. of Secondary roots (g) | Fresh weight of roots | Dry weight of roots (g) |
|---|---|---|---|---|---|
| Control | 14.60 | 10.60 | 45.60 | 7.82 | 2.44 |
| 1% Urea | 15.40 | 12.60 | 48.80 | 8.32 | 2.47 |
| $GA_3$ 10 ppm+ 0% Urea | 21.00 | 11.80 | 38.40 | 7.82 | 2.34 |
| $GA_3$ 10 ppm + 1% Urea | 21.60 | 11.80 | 37.60 | 8.80 | 2.11 |
| $GA_3$ 30 ppm+ 0% Urea | 17.60 | 12.80 | 32.40 | 7.68 | 2.31 |
| $GA_3$ 30 ppm+ 1% Urea | 22.80 | 13.00 | 49.20 | 11.12 | 3.71 |
| $GA_3$ 50 ppm+ 0% Urea | 12.00 | 11.40 | 41.20 | 10.26 | 2.98 |
| $GA_3$ 50 ppm+ 1% Urea | 20.60 | 12.60 | 52.20 | 11.42 | 3.86 |
| $GA_3$ 100 ppm+ 0% Urea | 18.20 | 11.80 | 45.80 | 10.24 | 3.49 |
| $GA_3$ 100 ppm+ 1% Urea | 20.40 | 15.00 | 54.20 | 10.24 | 3.62 |
| CD at 5% | 2.81 | 1.89 | 1.56 | 0.86 | 0.26 |