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Effect of Growth Regulators and Macronutrients on Seedling Growth of Mango (*Mangifera indica* L.)

J. N. Mahammad Nazim*, Venkat Rao, G. K. Halesh and K. J. Dayamani

College of Horticulture, RHREC, UHS campus, GKVK Post, Bengaluru

*Corresponding Author E-mail: hortinazim@gmail.com

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ABSTRACT

An experiment was conducted during 2015-16 at College of Horticulture, Bengaluru to study the effect of plant growth regulators and macronutrients on the growth of mango seedlings. The treatment with GA_3 150 ppm + NAA 150 ppm has recorded the maximum seedling height (31.87 cm), girth (0.80 cm), number of leaves (16.82), leaf area (294.17), percent of graftable seedling (71.47 %), fresh and dry weight of seedlings (27.99 and 11.34 gm) and root parameters of mango seedlings.

Key words: *Growth regulators, Macronutrients, GA_3, NAA, Growth, Mango*

INTRODUCTION

Mango (*Mangifera indica.* L.) is the most important commercially grown fruit crop of India and is considered as national fruit. It belongs to family Anacardiaceae and is native of Indo-Burma region[6].

The present day nursery practices involve high cost and risks with respect to raising of seedling rootstocks and their subsequent maintenance till they attain the graftable size. Healthy growth of rootstock is most important in attaining the higher rate of grafting success. In the nursery activities, the preparation of media and use of growth regulators should receive the considerable attention of the nursery man and growers for improving the germination and subsequent growth of seedlings.

Hence the present study was taken to find out the effect of biofertilizers, growth regulators and macronutrients on seedling growth of mango was taken.

MATERIALS AND METHODS

The experimental trials "Effect of growth regulators, macronutrients, biofertilizers and media on seedling growth of mango (*Mangifera indica*. L.)" was conducted at Regional Horticultural Research and Extension Centre, University of Horticultural sciences campus, GKVK, Bangalore 560065, during the year 2015 – 16. This experiment was carried out to see the effect of foliar application of different growth regulators and macronutrients on seedling growth of mango.

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The experiment was laid out in completely randomized design with three replications. The experiment comprised of sixteen treatments with the combinations of plant growth regulators, namely Gibberellic acid (GA_3), Naphthalene acetic acid (NAA) and KNO_3. Macronutrients namely Urea, water soluble NPK and Cow urine were also used at different concentrations.

Seedlings was raised in the beds. The reddish tinge colored seedlings were collected from the bed and transplanted in the prefilled poly bags having potting mixture of Red soil, FYM and sand (1:1:1). The required quantities of plant growth regulators and macronutrients were prepared through stock solution with their different concentrations and was sprayed as per the treatment for seedlings. The first spray was taken up 30 days after transplanting and second spray was taken 30 days after first spray.

RESULTS AND DISCUSSION

The results (Table 1) revealed that the maximum seedling height, number of leaves, stem girth, leaf area and percent of graftable seedlings (31.87 cm, 16.82, 0.80 cm, 294.17 and 71.47% respectively) was recorded at 195 days after transplanting in GA_3 150 ppm + NAA 150 ppm. The minimum was recorded in control water spray (T_{16}) with respect to seedling height, number of leaves, stem girth, leaf area and percent of graftable seedlings. The application of GA_3 and NAA increased the plant height and seedling girth in mango is mainly due to cell elongation, increase in size and rapid cell division. Due to this the elongation of internode will takes place, hence the seedling height will increase. Similar results were observed by Marler and Mickelbert[4] in Carambola, Kawthalkar and Kunte[2] in Rangpur lime.

The production of more number of leaves may be due to the vigorous growth induced by the GA_3 and NAA treatments, more number of branches which in turn facilitates better harvest of sunshine by the plants to produce more number of leaves. These results obtained on this aspect were in agreement with Marler and Mickelbert[4] in carambola, Kawthalkar and Kunte[2] in Rangpur lime. The maximum leaf area is mainly due to the fact that NAA improves the internal physiology of plant in terms of better supply of water, nutrient and other bio compounds vital for their proper growth and development which in turn helps to produce more leaf area per seedlings. This might be due to maximum height of seedling under this treatment. Variation in leaf area due to the treatments with hormones and chemicals was also reported by Agarwal[1] in citrus and Khobragode *et al*[3]., in mango who reported that, greater leaf area was associated with vigorous rootstocks.

Table 1: Effect of foliar spray of growth regulators and macronutrients on seedling height, Number of leaves, seedling girth, leaf area and per cent of graftable seedlings of mango

Treatments	Seedling height (cm)	Number of leaves	Seedling girth (cm)	Leaf area	Graftable seedlings (%)
T_1: GA_3 50ppm + NAA 50ppm	30.17	15.50	0.76	275.88	68.67
T_2: GA_3 100ppm + NAA 100ppm	30.77	15.90	0.79	284.17	67.63
T_3: GA_3 150PPM + NAA 150ppm	31.87	16.82	0.80	294.17	71.47
T_4: Urea 1%	25.30	14.21	0.72	262.57	59.20
T_5: Urea 2%	26.28	15.17	0.69	266.47	62.03
T_6: Urea 3%	28.40	15.57	0.74	274.17	62.83
T_7: Water soluble NPK 1% (19:19:19)	26.97	12.93	0.73	263.47	63.53
T_8: Water soluble NPK 2% (19:19:19)	28.55	13.91	0.71	275.17	63.13
T_9: Water soluble NPK 3% (19:19:19)	28.47	14.60	0.71	262.87	63.43
T_{10}: Cow urine 25%	24.10	13.24	0.74	268.17	58.94
T_{11}: Cow urine 50%	25.77	14.08	0.69	272.27	56.80
T_{12}: Cow urine 100%	25.57	12.07	0.68	274.87	62.53
T_{13}: KNO_3 1%	24.07	13.04	0.69	265.27	55.60
T_{14}: KNO_3 2%	24.17	12.10	0.70	266.50	60.10
T_{15}: KNO_3 3%	24.94	12.60	0.72	277.47	62.53
T_{16}: Water spray (control)	22.30	10.47	0.61	230.08	43.60
SE.m±	1.35	1.15	NS	8.23	4.04
CD at 5%	3.88	3.32		23.73	11.66

The results (Table 2) revealed that the maximum fresh weight of seedling, dry weight of seedlings, root length, root volume and root dry weight (27.99 gm, 11.34 gm, 23.07 cm, 8.11 cm^3 and 6.98 gm respectively) was recorded at 195 days after transplanting in the treatment GA_3 150 ppm + NAA 150 ppm. The application GA_3 and NAA resulted in increased fresh and dry weight of seedlings was mainly due to as they translocated to the expanding internodes and beyond into apical region and young leaves. The increase in length was accompanied by increased dry weight and during expansion there was direct relation between dry weight and volume of water on the internode. The crude cell wall fraction of the dry weight also increases greatly and there was a direct relation between internode volume and amount of wall. Similar results were observed by Monselise and Halevy[5] in citrus.

The longest root was recorded at 195 days after transplanting revealed that there was non significant difference among the treatments. Among the treatments GA_3 150 ppm + NAA 150 ppm (T_3) produced the longest roots (23.07 cm) and shortest root was produced in control T_{16} water spray (13.93 cm). Maximum volume of roots (8.11 cm^3) were observed in GA_3 150 ppm + NAA 150 ppm (T_3) treatment which was on par with the treatment GA_3 100 ppm + NAA 100 ppm (T_2) i.e (7.68 cm^3). Minimum volume of root was observed in control (4.28 cm^3). The treatment GA_3 150 ppm + NAA 150 ppm (T_3) recorded the highest dry root weight (6.98 g) which was on par with T_2, T_8 and T_1 (6.28, 5.88 and 5.84 gm respectively) and minimum dry root weight were observed in control T_{16} water spray (2.98 g).

The root parameters were highest in GA_3 150 ppm + NAA 150 ppm (T_3) treatment is might be due to restorer effect of NAA on apical dominance which promoted root initiation, more nutrient uptake and root cell elongation and good growth of the roots. GA_3 increased somatic uptake of nutrients, causing cell elongation and thus increasing the root volume. The results obtained in the present studies are in agreement with that reported by Wagh *et al*[8]., in aonla and Virendra and Shafaat[7].

Table 2: Effect of foliar spary of growth regulators and macronutrients on fresh and dry weight of seedlings and root parameters

Treatments	Fresh weight (gm)	Dry weight (gm)	Root length (cm)	Root volume (cm^3)	Root dry weight (gm)
T_1: GA_3 50ppm + NAA 50ppm	25.65	10.32	21.57	6.75	5.84
T_2: GA_3 100ppm + NAA 100ppm	27.24	10.57	21.94	7.68	6.28
T_3: GA_3 150PPM + NAA 150ppm	27.99	11.34	23.07	8.11	6.98
T_4: Urea 1%	24.37	9.37	19.62	6.51	5.04
T_5: Urea 2%	23.06	9.04	21.17	6.72	4.71
T_6: Urea 3%	23.77	8.45	21.18	6.19	4.54
T_7: Water soluble NPK 1% (19:19:19)	25.00	9.21	20.12	6.10	4.49
T_8: Water soluble NPK 2% (19:19:19)	25.64	9.12	22.08	6.52	5.88
T_9: Water soluble NPK 3% (19:19:19)	26.12	8.75	20.86	6.14	4.65
T_{10}: Cow urine 25%	21.53	8.96	17.91	5.52	4.29
T_{11}: Cow urine 50%	21.57	9.14	17.78	5.65	4.18
T_{12}: Cow urine 100%	22.32	9.83	18.02	5.79	4.75
T_{13}: KNO_3 1%	22.32	8.96	18.81	6.24	4.33
T_{14}: KNO_3 2%	23.49	8.89	19.37	6.22	4.78
T_{15}: KNO_3 3%	24.62	9.12	18.02	6.02	4.95
T_{16}: Water spray (control)	19.65	7.90	13.93	4.28	2.98
SE.m±	1.18	0.57	NS	0.46	0.50
CD at 5%	3.40	1.64		1.33	1.43

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