RESEARCH PAPER | Agriculture | Volume : 4 | Issue : 12 | Dec 2014 | ISSN - 2249-555X

Studies on Application of Plant Growth Regulators And Macro Nutrients on Seedling Growth in Jamun [*Syzygium cuminii* (L.) Skeels]

KEYWORDS: Jamun (Syzygium cuminii (L.) Skeels), foliar application, growth regulators and macronutrients

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ABSTRACT *Jamun (Syzygium cuminii Skeels) is an important indigenous minor fruit of commercial value. Foliar application of growth regulators and macro nutrients are known to enhance the growth of seedlings of various fruit crops. The present investigation was carried out to reduce the time required to reach graftable size of jamun seedlings using growth regulators and macronutrients at Regional Horticultural Research and Extension Centre, Bengaluru during the year 2012-2013. The foliar application of GA3 at 300 ppm found to be beneficial to enhance the seedling height (57.66 cm), diameter (6.06 mm), fresh weight (94.66 g) and dry weight (35.86 g) and to reduce the number of days taken to reach graftable size (132.72 days) compared to control.*

INTRODUCTION

Jamun (*Syzygium cuminii* (L.) Skeels) is an important indigenous minor fruit of commercial value, belonging to the family Myrtaceae. It is widely cultivated in homestead gardens, backyard and as an avenue tree in the all parts of India. Recently it has attained an importance as an arid zone horticulture crop because of its hardiness and high potential yield, besides its nutritional and medicinal value. It is used for consumption for fresh fruits, also used for making delicious and nutritious squash, jams, jellies, juice and wines so on. Seeds contain various alkaloids such as *jambosin* and *glycoside* which inhibits the conversion of starch in to sugar. Therefore, the powdered seeds are useful for diabetic patients. Fruits are important in the Indian system of medicine and recommended for diabetes, heart and liver problems (Singh, 2001).

Even though seed propagation is practiced for commercial cultivation of jamun, vegetative propagation is commonly recommended to shorten gestation period. The time required to grow jamun seedlings to a suitable size for grafting may be as long as one year. Therefore, shortening this time is considered very important and it can be achieved by enhancing the seedling growth. Foliar spray of growth regulators and macro nutrients are known to enhance the growth of seedlings of various fruit crops. Foliar application of urea at 2 per cent increased the length of terminal shoots in mango cv. Dashehari. Similar results were obtained when sprayed with 20 ppm NAA and 20 ppm GA (Singh and Singh, 1974). Application of 500 mg GA_{4+7} to the stem improves the seedling growth and reduces the nursery time for producing graftable size in carambola seedlings (Marler and Mickelbert, 1992). The application of GA_3 at 50 ppm + urea at 0.5 per cent significantly increased various vegetative and root growth characteristics of aonla (Virendra and Shafaat, 1996). Foliar application of N and P either singly or in combination significantly enhanced the growth parameters in Khasi mandarin (Govind *et al.,* 2003). Foliar application of GA_3 300 ppm and 2 g N per plant increases the maximum seedling height (42.4 and 36.1 cm respectively), stem girth (1.43 and 1.05 cm respectively) and internodal length (8.6 and 6.2 cm respectively) in *Araucaria heterophylla* (Hazrat *et al.,* 2006). Application of GA_3 200 and 400 ppm increases the seedling height, stem thickness and number of leaves in valkamer and sour orange (Hoda *et al.*, 2010). In view of this, the present investigation was carried out to reduce the time required to reach graftable size of jamun seedlings using growth regulators and macronutrients.

MATERIALS AND METHODS

An experiment was conducted at Regional Horticultural Research and Extension Centre, Post Graduate Centre, Gandhi Krishi Vigyana Kendra (UHS) campus, Bengaluru, Karnataka during 2012-2013. Fully matured jamun fruits of local variety are collected and seeds were extracted by washing with water. The seeds were sown at 1-2 cm depth in polythene bags of 9 x 6 inches having six holes for proper drainage, containing potting mixture of red earth, sand and Farm Yard Manure in 2:1:1 ratio. The growth regulators and macro nutrients were sprayed using knapsack hand sprayer on two months old seedlings twice at monthly interval. Experiment was laid out in Completely Randomized Design (CRD) with eleven treatments and three replications. Each treatment consists of 10 plants. The details of treatments are as follows: T_1- Control (water spray), T_2- GA_3at 100ppm, T_3- GA_3 at 200ppm, T_4- GA_3 at 300ppm, T_5- NAA at 100ppm, T_6- NAA at 200ppm, T_7- NAA at 300ppm, T_8- Urea at 1%, T_9- Urea at 2%, T_{10}-Water soluble NPK at 1% and T_{11}-Water soluble NPK at 2%. The observations on plant height (cm) and stem diameter (mm) at monthly interval; fresh and dry weight of seedling (g) were recorded at the end of the experiment and days taken to reach graftable size (usually graftable size of the seedling should measures about 5 to 10 mm or pencil thickness, here we considered above 5 mm as graftable size) were recorded. An analysis of variance (ANOVA) was run on the data, and the differences between the treatments mean were further determined with the IBM SPSS statistics V. 21 software.

RESULTS AND DISCUSSION

The differences in the means of seedling height; stem diameter and days taken to reach graftable size were shown in Table 1. All the treatments differ significantly with the foliar application of GA_3 on jamun seedlings. The treatment

Volume : 4 | Issue : 12 | Dec 2014 | ISSN - 2249-555X

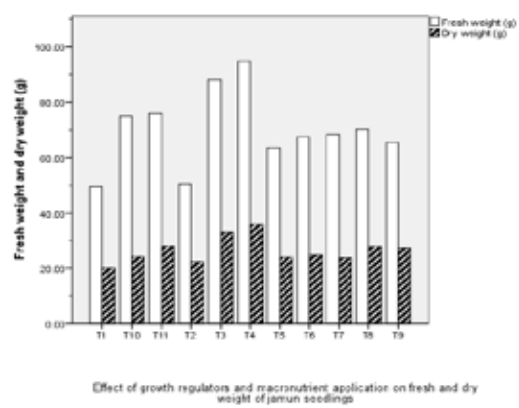
GA_3 at 300ppm (T_4) induced maximum seedling height (42.89 cm) at 30 days after spraying, which was on par with treatment GA_3 at 200ppm (T_3) (36.33 cm) and NAA at 300ppm (T_7) (35.33 cm) and minimum height (21.33 cm) was noticed in the treatment control (T_1). The height of the seedlings increased significantly in consecutive months and maintained the same trend. At 60, 90 and 120 days after spraying the maximum height (47.22, 52.33 and 57.66 cm respectively) was noticed in the treatment GA_3 at 300ppm (T_4), which was on par with GA_3 at 200ppm (T_3) (39.83, 43.66 and 49.00 cm) and NAA at 300ppm (T_7) (38.66, 42.50 and 47.00 cm) whereas the minimum height of 24.33, 29.16 and 35.66 cm respectively was recorded in control (T_1). The treatment GA_3 at 300ppm (T_4) significantly maximized the stem diameter (3.90, 4.95, 5.77 and 6.63 mm respectively) at 30, 60, 90 and120 days after spraying, followed by treatment GA_3 at 200ppm (T_3) (3.44, 4.30, 5.01 and 5.80 mm respectively), whereas the minimum diameter (2.98, 3.77, 4.60 and 5.23 mm respectively) was noticed in control (T_1). This may be due to cell elongation, increase in size and rapid cell division in turn resulted in elongation of internodes caused the increased seedling height as influenced by gibberellic acid. Similar results were observed in Carambola (Marler and Mickelbart, 1992) and in *Araucaria heterophylla* (Hazrat *et al.,* 2006). And increased number of leaves was observed with foliar spray of GA_3 at 300ppm (T_4) (Data not shown).The minimum number of days taken to reach graftable size (132.72 days) was recorded in GA_3 at 300ppm (T_4), followed by the treatment GA_3 at 200ppm (T_3) (147.36 days), while the maximum number of days taken to attain graftable size (181.66 days) was noticed in control (T_1). This may be due to induced vigorous growth by gibberellic acid. The promotion of growth in terms of increased plant height, stem diameter and number of leaves caused the increased plasticity of the cell wall followed by hydrolysis of starch to sugars which lowers the water potential of cell resulting in the entry of water into the cell causing cell elongation. This might have attributed to increase photosynthetic activity, accelerated translocation and efficiency of utilizing photosynthetic products resulting in cell elongation and rapid cell division in growing portion (Sargent, 1965).

Table 1: Effect of growth regulators and macronutrient application on growth parameters of jamun seedlings

Treatment	Plant height (cm)				Stem diameter (mm)				Number of days taken to reach graftable size
	30 DAS	60 DAS	90 DAS	120 DAS	30 DAS	60 DAS	90 DAS	120 DAS	
T_1	21.33	24.33	29.16	35.66	2.98	3.77	4.60	5.23	181.66
T_2	25.84	29.33	34.66	41.00	3.27	4.10	4.79	5.45	160.00
T_3	36.33	39.83	43.66	49.00	3.44	4.30	5.01	5.80	147.36
T_4	42.89	47.22	52.33	57.66	3.90	4.95	5.77	6.63	132.72
T_5	30.00	34.23	38.00	43.66	3.00	3.82	4.77	5.46	166.16
T_6	28.83	32.43	36.66	42.33	3.10	3.90	4.71	5.34	159.24
T_7	35.33	38.66	42.50	47.00	3.28	3.90	4.73	5.37	163.90
T_8	25.33	28.66	32.73	38.00	3.10	3.73	4.62	5.31	165.00
T_9	27.14	29.93	34.30	40.00	3.13	3.83	4.65	5.26	170.33
T_{10}	27.66	31.33	36.33	41.66	3.17	3.80	4.56	5.21	172.00
T_{11}	30.66	34.20	38.33	43.66	3.18	3.89	4.61	5.24	174.00
SE. m±	3.59	3.40	3.32	3.24	0.12	0.14	0.10	0.10	4.28
CD at 5%	7.45	7.06	6.88	6.73	0.24	0.28	0.20	0.22	8.88

The data on fresh weight and dry weight were presented in the figure 1. The maximum fresh and dry weight of seedling (94.66 and 35.86 g respectively) was noticed with the treatment GA_3 at 300ppm (T_4), which was on par with treatment GA_3 at 200ppm (T_3) (88.13 and 33.00 g respectively) and minimum (49.40 and 20 g respectively) fresh weight of seedling was noticed in control (T_1) at 120 days after spraying. The application of GA_3 resulted in increased fresh and dry weight of seedlings was mainly due to translocation of applied GA_3 to the expanding internodes and young leaves. Similar results were observed in citrus (Monselise and Halevy, 1962).

Figure 1: Effect of growth regulators and macronutrients application on fresh and dry weight of jamun seedlings



Effect of growth regulators and macronutrient application on fresh and dry weight of jamun seedlings

CONCLUSION:

The foliar application of GA_3 at 300ppm (T_4) found beneficial to maximizing the seedling height (57.66 cm), diameter (6.06 mm), fresh weight (94.66 g), dry weight (35.86 g) and minimizing the number of days taken to reach graftable size (132.72 days) compared to control.

ACKNOWLEDGEMENT

We would like to acknowledge the University of Horticultural Sciences, Bagalkot, India for providing full financial support for this project.

Volume : 4 | Issue : 12 | Dec 2014 | ISSN - 2249-555X

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