



Impact of GA₃ Seed pre- treatment on seedling growth in *Annona squamosa*

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Abstract

An experiment was conducted during the year 2016 at Shri Vyankatesh Arts, Commerce & Science College, Deulgaon Raja, Buldhana (MH) India, to study the impact of physical treatments of seeds with GA₃ (i.e. Control, 700, 710, 720, 730,740, 750, 760, 770,780,790 and 800 ppm concentration) on seedling growth in *Annona squamosa*. Seeds physically treated with of GA₃ at 790 ppm significantly enhanced the plant height (41.66cm), number of bipinnate leaves (8.33), maximum root length (28.66 cm), seedling fresh biomass (6.59 g) and dry biomass (2.55g) at 45 Days after sowing (DAS). Hence, it may be concluded that seeds pre- treated with GA₃ at 790 ppm play an important role for obtaining better quality seedlings of *Annona squamosa*.

Keywords: *annona squamosa*, GA₃, seedling

Introduction

The seed of leguminous tree have the germination problem, while success of the tree can be rated from the establishment and stand depends much on seedgermination. Seed of many tree species of Annonaceae family has hard seed coat [2] and hard endosperm [1]. Germination of very few tropical tree species information is available on breaking the seed dormancy [3]. Pretreatments in a wide sense are the treatment that seeds have to undergo in preparation of sowing [4]. Physiological dormancy generally related to Abscisic acid and Gibberellins as well as other hormones metabolisms inside. Sitaphal (*Annona squamosa*) is a species of flowering trees in the family annonaceae. *Annona squamosa* is native to the tropical Americas and West Indies, but the exact origin is unknown.

The tree was been widely planted for the last 150 years or more as it will produce fruit in as little as two to three years. A five-year-old tree can produce as many as 50 sugar apples.

Thin, simple, alternate leaves [18] occur singly [19], 5 centimetres (2.0 in) to 17 centimetres (6.7 in) long and 2 centimetres (0.79 in) [20] to 6 centimetres (2.4 in) wide [20]. Rounded at the base and pointed at the tip (oblong-lanceolate) [20]. Pale green on both surfaces and mostly hairless [19] with slight hairs on the underside when young. The sides sometimes are slightly unequal and the leaf edges are without teeth, inconspicuously hairy when young [18,19]. Leaf stalks are 0.4 centimetres (0.16 in) to 2.2 centimetres (0.87 in) [20]. long, green, and sparsely pubescent [19]. Solitary or in short lateral clusters of 2-4 about 2.5 centimetres (0.98 in) long [20]. greenish-yellow flowers on a hairy, slender [19] 2 centimetres (0.79 in) long stalk. [20] Three green outer petals, purplish at the base, oblong, 1.6 centimetres (0.63 in) to 2.5 centimetres (0.98 in) long, and 0.6 centimetres (0.24 in) to 0.75 centimetres (0.30 in) wide, three inner petals reduced to minute scales or absent. Very numerous stamens; crowded, white, less than 1.6 centimetres (0.63 in) long; ovary light green. Styles white, crowded on the raised axis. Each pistil forms a separate tubercle (small rounded wartlike protuberance), mostly 1.3 centimetres (0.51 in) to 1.9 centimetres (0.75 in) long and 0.6 centimetres (0.24 in) to 1.3 centimetres (0.51 in) wide which matures into the aggregate fruit [19].

Flowering occurs in spring-early summer [20] and flowers are pollinated by nitidulid beetles [10]. Aggregate and soft fruits form from the numerous and loosely united pistils of a flower [19] which become enlarged [20] and mature into fruits which are distinct from fruits of other species of genus [19] (and more like a giant raspberry instead).

The round or heart-shaped [19] greenish yellow, ripened aggregate fruit is pendulous [20] on a thickened stalk; 5 centimetres (2.0 in) [196] to 10 centimetres (3.9 in) in diameter [20, 9]. With many round protuberances [19] and covered with a powdery bloom. Fruits are formed of loosely cohering or almost free carpels (the ripened pistels). The pulp is white tinged yellow, edible and sweetly aromatic. Each carpel containing an oblong, shiny and smooth [19], dark brow to black, 1.3 centimetres (0.51 in) to 1.6 centimetres (0.63 in) long seed [19].

Hence the present study was under taken to find out the proper concentration of GA₃ for the seed pretreatment and its effects on seedling growth of *A.squamosa*

Methodology

The field experiment was conducted at the Biotechnology-cum-Tissue Culture Centre OfDr.BAMU, India during the year 2015- 16 in CRD design with three replications. Seeds were collected from candidate plus trees identified in Deulgaon Raja during the month of July 2015. Like most species of *Annona*, it requires a tropical or subtropical climate with summer temperatures from 25 °C (77 °F) to 41 °C (106 °F), and mean winter temperatures above 15 °C (59 °F). It is sensitive to cold and frost, being defoliated below 10 °C (50 °F) and killed by temperatures of a couple of degrees below freezing. It is only moderately drought-tolerant, requiring at least 700 mm of annual rainfall, and will not produce fruit well during droughts. It will grow from sea level to 2,000 metres (6,600 ft) and does well in hot dry climates, differing in its tolerance of lowland tropics from many of the other fruit bearers in the *Annona* family.

The seeds were subjected to pre- sowing treatment with GA₃ of different concentration separately each for 24 hours, Viz: 700, 710, 730, 740, 750, 760, 770,780,790, 800 ppm and a control.

The pretreated seeds were sown in nursery in poly pots containing planting mixture of soil, sand and FYM of ratio 2:1:1; seed were sown at the rate of 10 seeds per replication Seeds were monitored for 45 days of sowing to record plant height (30 DAS/45 DAS), number of bipinnate leaves (30 DAS/45 DAS), root length, fresh biomass, dry biomass and survival percentage were calculated on observations basing on the number of seedling survived Randomly five seedlings from each replication were marked for observation. The data generated were analyzed using SAS 7.0. The data were subject to ANOVA and the treatment means were compared¹².

Results and Discussion

The results on the *in vivo* seedling growth obtained during the experiment, was carried out to visualize a significant influence of different concentration of GA3 on seedling growth of *Annona squamosa*. The increase in the concentration of GA3 increased the growth of the seedling and then there was a steady decline.

Analysis of variance revealed significant difference in seedling height, number of bipinnate leaves, root length, fresh biomass, dry biomass and survival percentage over time (P=0.05). The growth attributes and biomass were influenced by the different concentration of GA3. At 30 DAS highest plant height (37.33cm), Number of bipinnate leaves (7.66) were recorded in T11 (790 ppm). The lowest plant height (13.66cm) and number of bipinnate leaves (4.33) were recorded at T1 (Control). In case of 45 DAS highest plant height (41.66cm) and number of

bipinnate leaves (8.33) were recorded in the similar treatment as in 30DAS in T11. Lowest plant height (15.00 cm) and number of bipinnate leaves (5.00) were recorded in control. The superiority in growth parameters may be due to the GA3, the possible reason for the increase in growth parameters was due to the physiological effect of gibberellins on growth parameters of plant cells e.g., Cell elongation and cell division¹³. All GA3 treatments were effective for increasing in growth of seedling when compared with the control. This may be due to activated amylase which digested the available carbohydrate into simpler sugar, so that energy and nutrition were easily available to faster growing seedling. Increase in plant growth due to GA3 treatment¹⁴. Survival percentage of seedling was significantly highest (76.67) in T11 and lowest (20.00) in T1. This result corroborated with the findings of Ashraf *et al.*¹⁵. Highest root length (28.66cm) were recorded in T11 and lowest (9.33cm) were recorded in T1. Here increase in length of root was recorded in the similar treatment to which has boosted the growth of the seedling above ground level, it might have given the same effect for the below ground i.e. in the root. With regards to fresh biomass significantly highest (6.59 g) was recorded in T11 and lowest (1.61g) in control. In case of dry biomass highest (2.55g) were recorded in T11 and lowest (0.44g) in control. Plant growth regulators in overcoming the harmful effect on growth may be due to the change in endogenous growth regulators¹⁶. It has been confirmed that seed pretreatment with GA3 promotes the growth¹⁷.

Table 1: Effect of GA3 Seed pre-treatment on seedling growth of *Annona squamosa*

Treatments	Parameters							
	Plant Height @ 30 DAS (cm)	Number of Bipinnate leaves @ 30 DAS	Plant Height @ 45 DAS (cm)	Number of Bipinnate leaves @ 45 DAS	Survival percentage @ 45 DAS	Root Length @ 45 DAS (cm)	Fresh Biomass (g)	Dry Biomass (g)
T1 (Control)	12.66	3.33	14.00	4.00	18.00	8.33	1.31	0.44
T2 (700 ppm)	17.00	4.33	18.66	5.33	32.33	14.66	2.33	0.68
T3 (710 ppm)	20.00	5.33	23.33	6.33	38.00	16.33	3.04	0.85
T4 (720 ppm)	26.33	6.33	32.00	6.66	46.67	19.00	3.15	1.02
T5 (730 ppm)	32.00	6.33	36.00	7.33	50.00	20.66	3.16	1.09
T6 (740 ppm)	32.66	6.33	36.33	7.33	53.33	22.33	3.62	1.46
T7 (750 ppm)	34.33	6.64	36.64	7.64	53.22	23.33	3.72	1.24
T8 (760 ppm)	35.30	6.64	37.65	7.66	53.22	23.66	3.76	1.24
T9 (770 ppm)	35.30	6.64	38.32	7.66	53.22	24.33	3.94	1.24
T 10 (780ppm)	35.30	7.32	39.32	8.00	60.00	25.00	5.84	1.64
T 11 (790ppm)	36.33	7.64	41.63	8.33	76.65	28.64	6.57	2.52
T12 (800 ppm)	26.66	4.62	30.64	6.33	46.65	15.00	2.43	0.76
C. D. at 5%	4.50	0.62	4.81	1.13	8.01	1.80	0.60	0.48

Conclusion

In conclusion, the results indicated the significant effect of GA3 on the seedling growth of *A squamosa*. Therefore 790 ppm GA3 seed pre-treatment is recommended to obtain better growth and survival rate of this threatened tree species.

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