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Studies on influence of plant growth promoting hormone and chemicals on germination, growth and vigour of seedlings in custard apple (*Annona squamosa* L.) cv. Balanagar

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Abstract
The present investigation was conducted at Fruit Science block, Department of Fruit Science, College of Horticulture, Anantharajupeta, Dr. Y.S.R. Horticultural University, Andhra Pradesh during the year 2020-21. The experiment was laid out in completely randomized design for germination parameters and factorial concept for physiological parameters with two factors and three replications. Result of present investigation revealed that the custard apple seeds soaked in S_2 (Thiourea @ 500ppm for 12hr) found significantly maximum number of leaves at 30 DAS, whereas S_1 (GA_3 @ 200 ppm for 12hr) was found better for germination *viz*. days taken for germination, percentage of germination, plant height and physiological parameters *viz*. rate of photosynthesis, rate of transpiration, stomatal conductance, leaf temperature, internal cellular CO_2. Among the foliar spray of different growth substances, custard apple seedlings sprayed with F_1 (GA_3 @ 200ppm) was found better for rate of photosynthesis, rate of transpiration, stomatal conductance and F_3 (19:19:19 @ 1%) was found better for leaf temperature, internal cellular CO_2 at 45 and 60 DAS. Considering the interaction effect between seed treatment and foliar spray of chemical substances, found better for rate of photosynthesis, rate of transpiration, stomatal conductance in custard apple seedlings receiving treatment combination of S_1F_1 (GA_3 @ 200 ppm for 12hr as a seed treatment and GA_3 @ 200 ppm at 45 and 60 days after sowing as a foliar spray) and S_1F_3 (GA_3 @ 200 ppm and 19:19:19 @ 1%) was found better for leaf temperature, internal cellular CO_2.

Keywords: GA_3, germination, growth substances, seed treatment, thiourea foliar spray

Introduction
Custard apple (*Annona squamosa* L.) is an important fruit crop and cultivation spread in tropical and subtropical zones around the world. The edible fruits of genus Annona are collectively known as annonaceous fruits and it belongs to the family annonaceae. There are an estimated 2200 species of annonaceae in the world, but mainly three species are cultivated viz., *Annona squamosa*, *Annona cherimoya* and *Annona muricata* (Mahdeem, 1994) [7]. The custard apples are mainly grown in tropical parts of America, Australia, Brazil, Egypt and India. The major custard apple growing states in India are Maharashtra, Gujarat, Andhra Pradesh, Karnataka, Uttar Pradesh, Bihar and Assam with an area of 41 thousand hectares with an annual production of 347 thousand MT and in Andhra Pradesh it is growing in an area of 1.68 thousand hectares with an annual production of 16.67 thousand MT (NHB, 2019-20) [10].
Custard apple is a drought tolerant, hardy fruit crop and grows well even in shallow and sub marginal soils without much care. The plant is erect, with a round or spreading crown and height ranges from 4.5-6 m and trunk size is 25-35 cm, leaves are oblong or narrow- lanceolate with 10-20 cm long and 2-5 cm wide with conspicuous veins. The flowers are hermaphrodite and appear singly or in small drooping clusters and exhibit protogyny. The fruit is an aggregate, which is composed of peel, pulp and seeds, of which 45% are the edible portion. The edible fruit contains 23.5g carbohydrates, 3.1g fibre, 1.6g protein and 0.4g fat per 100g of pulp and it is also rich in minerals like 17mg calcium, 47mg phosphorous, 37mg vitamin-C and provides 104 k Cal of energy (Pareek and Sharma, 1993).
The role of plant growth regulators has been well recognized in agricultural production (Chacko and Singh, 1966) [2]. Soaking of the seed in water, KNO_3, thiourea, gibberellic acid stimulates the germination process and subsequently seedling growth. Nurserymen are often encountered with problem of germination and poor growth and development of seedling

restricts the availability of healthy planting material on large scale. In order to have uniform and prompt germination period and to avoid the problem of uneven and irregular germination. For keeping all the constraints in mind, the present experiment has been conducted to know the impact of seed treatment and foliar spray of chemical substances on seed germination, growth and physiological parameters in Custard apple.

Material and Methods

The present experiment was carried out in a shade net condition at Fruit Science Block, Department of Fruit Science, College of Horticulture, Anantharajupeta, Y.S.R. Kadapa district, Andhra Pradesh during the year 2020-21 to study the influence of plant growth promoting hormone and chemicals on germination, growth and vigour of seedlings in custard apple (*Annona squamosa* L.) cv. Balanagar which was falls under southern agro-climatic zone of Andhra Pradesh at an elevation of 162 m (531 feet) above mean sea level; geographically it lies between13^0 59' North latitude and 79^0 19' East longitude.

The experiment was laid out in completely randomized design for germination parameters and completely randomized design with factorial concept for physiological parameters. The treatments comprised of different seed treatments *viz*. S_1 (GA_3 @ 200ppm), S_2 (Thiourea @ 500ppm), S_3 (KNO_3 @ 1%), S_4 (water soaking), S_5 (control) were soaked for 12hr and different foliar application *viz*. F_1 (GA_3 @ 200 ppm), F_2 (Benzyl adenine @ 50 ppm), F_3 (19:19:19 @ 1%) and F_4 (water) at 45 and 60 days after sowing (DAS) with total 20 treatment combinations are employed in this experiment.

The seeds were collected from disease free and fully ripened fruits of custard apple cv. Balanagar and uniform size, healthy seeds were selected and used for the experimental purpose. Seeds were sown during the last week of January in polythene bags of size 9" × 3" filled with potting mixture (Red soil, FYM and Vermicompost 2:1:1 by v/v) and immediately watered by using rose cane and also maintained optimum moisture level when required. The observation on days taken for germination, percentage of germination, plant height, number of leaves at 30 DAS, rate of photosynthesis, rate of transpiration, stomatal conductance, leaf temperature and internal cellular CO_2 (LCi-SD portable photosynthetic system) recorded at 60, 90 and 120 DAS. The data recorded from the present studies were subjected to analysis by using standard method suggested by Panse and Sukhatme (1967) [13].

Results and Discussion

I. Germination Parameters

The data (Table 1) shown that all germination parameters are significantly influenced by hormone and chemical substances. Early germination (17.33 days) and maximum germination percentage (80.25%) was recorded when the seeds were soaked in S_1 (GA_3 @ 200ppm for 12hr) followed by S_2 (24.33 days) and S_2 (74.16 %). While maximum number of days (31.33) for germination and minimum germination percentage (57.50 %) was recorded in S_5 (control). The early germination in GA_3 treated seeds might be due to the direct involvement of GA_3 by relieving embryo them from dormancy through promoting protein synthesis and elongation of coleoptile, primary leaves and helps in the production of ethylene. GA_3 invokes the hydrolases synthesis especially-amylose enzyme, which favours the early seed germination (Stewart and Freebarin, 1969). Several studies also confirmed the effect of GA_3 treated seeds shown good germination in comparison with control. The increase in germination percentage as a result of seed treatment with GA_3 in the present study might be due to the fact that it plays a key role in initiation of germination process such as enlarging embryo and carbohydrates translocation to the aleurone layer, where it activates enzyme which converts starch into sugar and softening of the seed coats and allowing roots tips to burst. The present study is in conformity with the findings of Rajamanickam *et al.*, 2002, Rashmi Kumari *et al.*, 2007 [15, 5] in aonla; Garge *et al*., 2011 [3] in custard apple; Athani *et al*., 2013 [1] in guava; and Lalitha *et al*., 2020 [6] in aonla.

The maximum plant height (7.32 cm) was recorded when the seeds of custard apple soaked in S_1 (GA_3 @ 200ppm for 12hr) which was on par with S_2 (6.84 cm) and the minimum plant height (5.38 cm) was recorded in S_5 (control) treatment. The maximum plant height might be due to the reason that GA_3 increases osmotic uptake of all essential nutrients, cell elongation and thus facilitates rapid seedling growth and development (Feucht and Watson, 1958). The results have been supported by the findings of Gharge *et al*. (2011) and Gholap (2000) [4] who noticed that maximum seedling height in custard apple and aonla when the seeds were treated with GA_3 than other treatments. However, the maximum numbers of leaves (4.33) were recorded in seed treatment with S_2 (Thiourea @ 500ppm for 12hr), which was statistically on par with S_1 (3.93). Whereas, the minimum number of leaves (2.86) was noted in S_5 (control). The increase in number of leaves due to thiourea application favourably affects both carbohydrates and nitrogen metabolism which in turn to produce maximum number of leaves. The above results are in conformity with Mane *et al*. (2018) [8] in custard apple.

II. Physiological parameters

Significantly highest rate of photosynthesis (6.84, 8.90 and 11.10 µmol $m^{-2}s^{-1}$) was recorded in the seed treatment with S_1 (GA_3 @ 200ppm) and lowest rate of photosynthesis (2.92, 3.84 and 4.98 µmol $m^{-2}s^{-1}$) was observed in S_5 (control) at 60, 90 and 120 DAS (Table 2). Among the foliar application highest rate of photosynthesis (4.90, 6.58 and 8.25 µmol $m^{-2}s^{-1}$) was recorded with foliar spray of F_1 (GA_3 @ 200ppm), which was statistically on par with F_3 (4.88 µmol $m^{-2}s^{-1}$) at 60 DAS. The lowest rate of photosynthesis (4.22, 5.56 and 7.35 µmol $m^{-2}s^{-1}$) was recorded in F_4 (water spray) at 60, 90 and 120 DAS. The interaction effect also showed significant variation among treatment combination. The maximum rate of photosynthesis (7.38, 9.71 and 11.40 µmol CO_2 m^{-2} s^{-1}) recorded in seed treatment with S_1F_1 (GA_3 @ 200ppm and foliar spray with GA_3 @ 200ppm), which was found statistically on par with S_1F_3 (7.32 and 11.17 µmol $m^{-2}s^{-1}$) at 60 and 120 DAS. While minimum rate of photosynthesis (2.92, 3.02 and 4.11 µmol $m^{-2}s^{-1}$) was observed in S_5F_4 (without any seed treatment and foliar spray of water) at 60, 90 and 120 DAS. The maximum rate of photosynthesis was observed when plants were treated with GA_3, it might be due to the increased activity of the enzyme xyloglycon endotrans-glycosylase, which catalyzes the breaking and forming of bonds between xyloglycon residues, thus permitting a transient increase in cell wall extensibility and inducing elongation and cell expansion, which is ultimately enhances the shoot length and leaf area. The increased leaf area, in turn, provides opportunity for maximum light harvesting, which ultimately exhibit more dry matter production. Similar findings were also reported by and Misratia *et al.* (2013) [9] in

rice and Sekhar *et al*. (2018) in strawberry.

The higher rate of transpiration (3.26, 4.84 and 6.24 mmol $m^{-2}s^{-1}$) was recorded in S_1 (GA_3 @ 200ppm) and lowest rate of transpiration (1.42, 2.35 and 3.34 mmol m^{-2} s^{-1}) was observed in S_5 (control) at 60, 90 and 120 DAS. The same trend was noticed with foliar spray of F_1 (GA_3 @ 200ppm) was recorded higher rate of transpiration (2.48, 3.93 and 4.91 mmol $m^{-2}s^{-1}$) which was on par with F_3 (2.47, 3.90 and 4.84 mmol $m^{-2}s^{-1}$) and the lowest rate of transpiration (2.20, 3.43 and 4.42 mmol $m^{-2}s^{-1}$) was recorded in F_4 (water spray) at 60, 90 and 120 DAS. Interaction effect also showed significant variation among treatment combination. The maximum rate of transpiration (3.38, 5.47 and 6.51 mmol $m^{-2}s^{-1}$) was recorded in S_1F_1 (GA_3 @ 200ppm and foliar spray of GA_3 @ 200 ppm), which was on par with S_1F_3 (3.34) at 60 DAS. While, minimum rate of transpiration (1.21, 2.10 and 2.61 mmol $m^{-2}s^{-1}$) was observed in S_5F_4 (without any seed treatment and foliar spray of water) at 60, 90 and 120 DAS. In this study, seed treatment with GA_3 recorded maximum transpiration rate compared to other treatments, which might be due to higher protein and enzyme synthesis as well as carbonic anhydrase activity due to the GA_3 treatment. It facilitates enhancement of leaf chlorophyll and leaf area; results in higher photosynthetic activity and delay in senescence process that ultimately enhances the rate of transpiration in action of photosynthates accumulation in plants. Similar findings were also reported by Ouzounidou and Ilias (2005) [12] and Sekhar *et al*. (2018) in strawberry.

Significantly the highest stomatal conductance (0.24, 0.42 and 0.67 mmol $m^{-2}s^{-1}$) was recorded in the seed treatment with S_1 (GA_3 @ 200ppm) and lowest stomatal conductance (0.12, 0.24 and 0.31 mmol $m^{-2}s^{-1}$) was observed in S_5 (control) at 60, 90 and 120 DAS. Among the foliar application significantly highest stomatal conductance (0.20, 0.33 and 0.55 mmol $m^{-2}s^{-1}$) was recorded in F_1 (GA_3 @ 200ppm), which was on par with F_3 (0.19, 0.32 and 0.53 mmol $m^{-2}s^{-1}$). The lowest stomatal conductance (0.15, 0.29 and 0.48 mmol $m^{-2}s^{-1}$) was recorded in F_4 (water spray) at 60, 90 and 120 DAS. Interaction effect also showed significant variation among treatment combination. The maximum stomatal conductance (0.29, 0.48 and 0.72 mmol $m^{-2}s^{-1}$) recorded in treatment combination consists of S_1F_1 (GA_3 @ 200ppm and foliar spray of GA_3 @ 200ppm). While minimum stomatal conductance (0.11, 0.22 and 0.27 mmol $m^{-2}s^{-1}$) was observed in S_5F_4 (without any seed treatment and foliar spray of water) at 60, 90 and 120 DAS. The maximum stomatal conductance was recorded with GA_3 treatment, because GA_3 promotes the higher exchange of gases and pumping capacity of Ca_2^+ into the ER of guard cells that may lead to a higher stomatal activity. Further, GA_3 also increases the availability of CO_2 it may leads to the more efficient stomatal conductance along with its rate of reduction by RuBisCO (Misratia *et al.*, 2013 and Sekhar *et al*., 2018 in strawberry) [9].

Significantly highest leaf temperature (32.92, 34.04 and 35.15 ^{0}C) was recorded in S_1 (GA_3 @ 200ppm) and the lowest leaf temperature (30.38, 30.07 and 31.13 ^{0}C) was observed in S_5 (control) at 60, 90 and 120 DAS. Among the foliar application highest leaf temperature (31.87, 32.37 and 33.47 ^{0}C) was recorded with the foliar spray F_3 (19:19:19 @ 1%) and lowest leaf temperature (31.07, 31.60 ^{0}C) was recorded in F_4 (water spray) at 60 and 90DAS, whereas at 120 DAS the lowest leaf temperature (32.74 ^{0}C) was noticed in F_2 (Benzyl Adenine @ 50ppm). Interaction effect also showed significant variation among treatment combination on leaf temperature. The maximum leaf temperature (33.50, 34.80 and 35.63 ^{0}C) was recorded in S_1F_3 (GA_3 @ 200ppm along with foliar spray of 19:19:19 @ 1%), while the minimum leaf temperature (30.03, 30.00 ^{0}C) was recorded in S_5F_4 (without any seed treatment and foliar water spray) at 60 and 90 DAS, whereas at 120 DAS the treatment S_5F_2 (without any seed treatment and foliar spray of Benzyl Adenine @ 50ppm) recorded lowest leaf temperature (30.70 ^{0}C). The leaf temperature maximum in GA_3 treated seedlings because it stimulates the leaf expansion and facilitates maximum plant physiological activities and ultimately enhances the photosynthetic activity which leads to higher leaf temperature (Ogasawara *et al*., 2001) [11]. Internal cellular CO_2 with different seed treatment, foliar spray and interaction effect revealed that it had non-significant effect on custard apple seedling at 60, 90 and 120 DAS.

Table 1: Effect of seed treatments on days taken for germination, percentage of germination, plant height and number of leaves in custard apple cv. Balanagar

Seed treatment	Days taken for germination	Percentage of germination (%)	Plant height(cm) at 30 DAS	No. of leaves at 30 DAS
S_1	17.33	80.25 (63.60)	7.32	3.93
S_2	24.33	74.16 (59.45)	6.84	4.33
S_3	26.33	70.83 (57.29)	6.47	3.87
S_4	27.00	64.16 (53.22)	5.72	3.40
S_5	31.33	57.50 (49.29)	5.38	2.86
C.D (5%)	2.64	4.23	0.75	0.44
SE(m) ±	0.83	1.32	0.23	0.14

*S_1-GA_3 @ 200ppm, S_2-Thiourea @ 500ppm, S_3-KNO_3 @ 1 % S_4-water soaking, S_5-control (Figures in parenthesis indicates angular transformed values of percentage of germination)

Table 2: Effect of seed treatments and foliar spray on rate of photosynthesis (µmol m-2s-1), rate of transpiration (mmol m-2s-1) and Stomatal conductance (mmol m-2s-1) in custard apple cv. Balanagar

Seed treatment/foliar spray	Rate of photosynthesis (µmol $m^{-2}s^{-1}$)														
	60DAS					90DAS					120DAS				
	F_1	F_2	F_3	F_4	Mean	F_1	F_2	F_3	F_4	Mean	F_1	F_2	F_3	F_4	Mean
S_1	7.38	6.53	7.32	6.14	6.84	9.71	8.32	9.37	8.20	8.90	11.40	11.00	11.17	10.82	11.10
S_2	5.49	5.08	5.55	5.05	5.29	7.94	7.12	7.39	6.52	7.24	10.50	9.13	9.66	8.38	9.42
S_3	4.62	4.05	4.43	3.96	4.26	6.01	5.94	6.04	5.25	5.81	7.39	7.12	7.45	7.13	7.27
S_4	3.92	3.45	3.95	3.55	3.72	5.08	5.03	5.13	4.79	5.01	6.68	6.42	6.77	6.29	6.54
S_5	3.09	3.03	3.15	2.42	2.92	4.16	4.04	4.15	3.02	3.84	5.27	5.11	5.42	4.11	4.98

Mean	4.90	4.43	4.88	4.22		6.58	6.09	6.41	5.56		8.25	7.75	8.09	7.35	
	C.D (5%)		SE(m)±			C.D (5%)		SE(m)±			C.D (5%)			SE(m)±	
S	0.18		0.06			0.16		0.06			0.16			0.06	
F	0.16		0.06			0.14		0.05			0.15			0.05	
(S X F)	0.36		0.12			0.32		0.11			0.33			0.11	
Rate of transpiration (mmol $m^{-2}s^{-1}$)															
S_1	3.38	3.21	3.34	3.10	3.26	5.47	4.59	5.04	4.25	4.84	6.51	6.21	6.11	6.11	6.24
S_2	2.99	2.83	2.99	2.58	2.85	4.40	4.08	4.37	4.18	4.26	5.86	5.58	5.47	5.35	5.57
S_3	2.52	2.46	2.63	2.40	2.50	3.94	3.74	4.03	3.56	3.82	4.52	4.20	4.66	4.11	4.37
S_4	2.00	1.93	1.86	1.71	1.88	3.30	3.10	3.42	3.07	3.22	4.05	4.00	4.21	3.91	4.04
S_5	1.51	1.43	1.54	1.21	1.42	2.57	2.10	2.65	2.10	2.35	3.59	3.41	3.74	2.61	3.34
Mean	2.48	2.37	2.47	2.20		3.93	3.52	3.90	3.43		4.91	4.68	4.84	4.42	
	C.D (5%)		SE(m) ±			C.D (5%)		SE(m)±			C.D (5%)			SE(m)±	
S	0.03		0.01			0.10		0.03			0.09			0.03	
F	0.03		0.01			0.09		0.03			0.08			0.03	
S X F)	0.06		0.02			0.19		0.07			0.19			0.07	
Stomatal conductance (mmol $m^{-2}s^{-1}$)															
S_1	0.29	0.23	0.25	0.20	0.24	0.48	0.40	0.44	0.36	0.42	0.72	0.65	0.68	0.62	0.67
S_2	0.25	0.20	0.22	0.18	0.21	0.36	0.33	0.32	0.34	0.34	0.65	0.60	0.64	0.59	0.62
S_3	0.19	0.16	0.19	0.15	0.17	0.30	0.30	0.31	0.28	0.30	0.56	0.54	0.58	0.53	0.55
S_4	0.13	0.12	0.15	0.13	0.13	0.27	0.26	0.28	0.25	0.27	0.43	0.41	0.47	0.36	0.42
S_5	0.12	0.11	0.13	0.11	0.12	0.25	0.22	0.26	0.22	0.24	0.39	0.30	0.29	0.27	0.31
Mean	0.20	0.16	0.19	0.15		0.33	0.30	0.32	0.29		0.55	0.50	0.53	0.48	
	C.D (5%)		SE(m)±			C.D (5%)		SE(m)±			C.D (5%)			SE(m)±	
S	0.01		0.00			0.01		0.01			0.02			0.01	
F	0.01		0.00			0.01		0.00			0.02			0.01	
S X F)	0.02		0.01			0.03		0.01			0.03			0.01	

Table 3: Effect of seed treatments and foliar spray on leaf temperature (0c) and Internal cellular CO2 (µmol CO2 m-2s-1) in custard apple cv. Balanagar

Seed treatment/foliar spray	**Leaf temperature (^{0}c)**														
	60DAS					**90DAS**					**120DAS**				
	F_1	**F_2**	**F_3**	**F_4**	**Mean**	**F_1**	**F_2**	**F_3**	**F_4**	**Mean**	**F_1**	**F_2**	**F_3**	**F_4**	**Mean**
S_1	32.70	33.43	33.50	32.03	32.92	34.47	33.77	34.80	33.13	34.04	35.23	34.57	35.63	35.17	35.15
S_2	32.10	31.80	32.03	31.50	31.86	32.80	32.27	32.80	32.53	32.60	34.53	33.79	34.67	33.70	34.17
S_3	31.50	31.57	31.80	31.10	31.49	32.17	31.93	32.63	31.30	32.01	33.40	33.20	33.77	32.60	33.24
S_4	30.93	30.57	31.20	30.70	30.85	31.23	31.13	31.57	31.03	31.24	31.80	31.43	31.87	31.53	31.66
S_5	30.43	30.23	30.80	30.03	30.38	30.17	30.07	30.03	30.00	30.07	31.20	30.70	31.40	31.20	31.13
Mean	31.53	31.52	31.87	31.07		32.17	31.83	32.37	31.60		33.23	32.74	33.47	32.84	
	C.D (5%)		SE(m) ±			C.D (5%)		SE(m) ±			C.D (5%)			SE(m) ±	
S	0.23		0.08			0.13		0.05			0.16			0.05	
F	0.21		0.07			0.12		0.04			0.14			0.05	
(S X F)	0.46		0.16			0.26		0.09			0.31			0.11	
	Internal cellular CO_2 (µmol CO_2 $m^{-2}s^{-1}$)														
S_1	353.33	331.67	357.33	318.67	340.25	349.00	341.00	379.33	326.33	348.92	356.33	337.33	383.00	331.00	351.92
S_2	323.33	310.00	341.67	309.00	321.00	342.00	313.00	357.67	337.00	337.42	372.00	346.67	362.33	332.00	353.25
S_3	342.00	324.33	325.00	312.00	325.83	345.67	336.33	330.67	316.33	332.25	357.00	357.33	363.67	339.33	354.33
S_4	308.33	292.67	346.00	285.67	308.17	323.00	321.00	332.33	301.00	319.33	325.00	346.67	340.33	315.67	331.92
S_5	312.33	307.67	325.33	297.00	310.58	266.33	257.00	281.00	255.00	264.83	293.00	279.00	269.00	259.67	275.17
Mean	327.87	313.27	339.07	304.47		325.20	313.67	336.20	307.13		340.67	333.40	343.67	315.53	
	C.D (5%)		SE(m) ±			C.D (5%)		SE(m) ±			C.D (5%)			SE(m) ±	
S	NS		4.88			NS		4.94			NS			4.01	
F	NS		4.37			NS		4.42			NS			3.59	
S X F)	NS		9.76			NS		9.88			NS			8.03	

S1: GA3 @ 200ppm
S2: Thiourea @ 500ppm
S3: KNO3 @1.0%
S4: Water soaking

F1: GA3 @ 200ppm
F2: Benzyl adenine @ 50ppm
F3:19:19:19 @ 1.0%
F4: Control (water spray)

S5: (control) without any soaking

Conclusion

By the present experimental results, it can be concluded that seed soaking with GA_3 @ 200 ppm for 12hr was showed higher germination, growth and physiological parameters of custard apple seedlings cv. Balanagar. Among the foliar spray of growth substances, GA_3 @ 200 ppm at 45 and 60 days after sowing was found most effective with respect to growth and physiological parameters in comparison with other growth substances. Among the interaction combinations, seed treatment with GA_3 @ 200 ppm and foliar spray of GA_3 @ 200 ppm at 45 and 60 days after sowing was found better for physiological parameters in custard apple cv. Balanagar.

Reference

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