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MS Patel
Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat, India

KH Nurbhanej
Ph.D. Scholar, Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat, India

VS Patel
Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat, India

AN Vihol
Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat, India

BC Gohel
Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat, India

Correspondence
KH Nurbhanej
Ph.D. Scholar, Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat, India

Effect of media and GA_3 on seedling growth of custard apple (*Annona squamosa* L.) CV. Sindhan

MS Patel, KH Nurbhanej, VS Patel, AN Vihol and BC Gohel

Abstract
An investigation was carried out to see the effect of media and GA_3 on seedling growth of custard apple (*Annona squamosa* L.) cv. Sindhan during summer season of the year 2016 at Lalbaugh Farm, Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat). Amongst different growing media, height of seedlings, stem girth, number of leaves, leaf area at 60, 90 and 120 DAS were found significantly superior under M_4 - soil + cocopeat + sand + FYM (1:1:1:1). Similarly, same treatment M_4 - soil + cocopeat + sand + FYM (1:1:1:1) had also recorded the significantly maximum number of roots, root length, fresh and dry weight of shoot, fresh and dry weight of root and root-shoot ratio of custard apple seedling during course of experimentation.
Amongst the different concentration of GA_3, (G_3- 200 mg/l) had significant influence on different parameters like maximum height of seedling; stem girth, number of leaves (and leaf area at 60, 90 and 120 DAS, respectively. Similarly, the same treatment (G_3- 200 mg/l) was also recorded the maximum number of roots, root length, fresh and dry weight of shoot, fresh and dry weight of root and root-shoot ratio of custard apple seedling during course of experimentation.
As regards the interactions, seedling growth parameters were found significant. Among the different combination of media and GA_3 concentration treatment M_4G_3 - soil + cocopeat + sand + FYM (1:1:1:1) with GA_3 200 mg/l had given maximum height of seedling, stem girth, number of leaves, leaf area at 60, 90 and 120 DAS, respectively. Similarly, same treatment combination M_4G_3 - soil + cocopeat + sand + FYM (1:1:1:1) + GA_3 200 mg/l had given maximum fresh and dry weight of shoot and fresh and dry weight of root of custard apple seedling. Overall it can be concluded that soil + cocopeat + sand + FYM (1:1:1:1) media with GA_3 200 mg/l seed treatment was found superior for growth of custard apple seedling cv. Sindhan.

Keywords: Custard apple, Sindhan, Media, Cocopeat

Introduction
Custard apple (*Annona squamosa* L.) belongs to family Annonaceae and is one of the finest fruits gifted to India by tropical America. It is commonly found in India and cultivated an area of 23 thousand ha with production of 176 MT [14]. Custard apple, popularly known as Sitaphal is grown mainly in the States of Andhra Pradesh, Assam, Tamil Nadu, Madhya Pradesh and grows wild in Deccan plateau and some parts of central India.
Custard apple is cultivated in Mexico, Philippines, New Guinea, Malaysia, India and South American countries in the world. The Spaniard probably carried seeds from the new world to the Philippines and the Portuguese are assumed to have introduced the sugar apple to southern India before 1590. It has adopted well in India where a considerable variability is found in Aravali hills and Southern India. In Andhra Pradesh, custard apple plants are found wild in Sangareddy and other areas. Custard apple plants can also be seen wild in Uttar Pradesh, Rajasthan, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu, Gujarat and Orissa.
In Gujarat, it is cultivated in Junagadh and Bhavnagar district of Saurashtra region. The area under custard apple is also increasing in other districts like Ahmadabad, Sabarkantha, Patan, Gandhinagar and Anand. Some common varieties of custard apple cultivated in Gujarat are Sindhan, Balanagar, Red Sitaphal and GJCA-1. "Sindhan" is a local variety found on large area in Girnar hills of Junagadh district in Gujarat state. Gujarat covering an area of 5081 hectares with the production of 51906 MT and productivity was 10.21 MT/ha during the year 2014-15 [10].
Generally, the plants of this species are shrub or small trees, with fairly short and smooth trunk reaching height up to 5.0 to 7.5 meter and trunk size is 25-35 cm. Owing to hard nature, tree

escape from animal damage. Custard apple is a drought tolerant and hardy plant. It grows well even in shallow soil without much care. It is deciduous in nature which sheds leaves during winter season. New growth flush comes during spring with the initiation of flowers. It is erect, with a round or spreading crown. Custard apple has become naturalized in many tropical and subtropical regions. Sugar apple is more adaptable to low temperature than soursop and cherimoya. Rainfall and high humidity during peak flowering season greatly enhances the fruit production of sugar apple. It is not too demanding for soil type, but come up with well drainage properties and rich organic matter. Sugar apple grows well in deep soil with good aeration and no water logging condition having range pH 6.0 to 7.5.

The seeds of Annonaceae are albuminous ellipsoids and their length varies between 5 and 30 mm. They have a ruminate endosperm. The embryo is small, straight, with moderately developed embryonic axis, rudimentary plumule and a flat and thin cotyledon; which develops after the seed is formed [9]. [26] observed that *Annonaceae* seeds undergoing dispersal have a small embryo that is considered underdeveloped and immature; immaturity requires time to complete embryo growth after seed dispersion. Meanwhile, [13] reported that the seeds of *A. squamosa* have a small embryo with two foliaceous, thin cotyledons that take one to three months to germinate.

Seed germination is the resumption of active growth of embryo that results in the emergence of the young plant. Seeds of many fruit crops remain ungerminated even under favourable conditions. Such kind of dormancy in seeds may be due to presence of hard and impermeable seed coat, germination inhibitors and improper development of embryo. Such seeds may require special treatments like scarification, soaking in water, growth regulators etc. to overcome dormancy. Gibberellins (GA_3) activate the embryonic vegetative growth, weakens the endosperm layer that involves the embryo and restricts its growth, and mobilizes the energetic reserves from the endosperm of cereals [6], [27]. Cereal embryo synthesizes and releases GA during the germination, which leads to the production and/or secretion of several hydrolytic enzymes involved in the solubilization of reserves, including α-amylase and β-amylase [27].

Growing media is one of the important environmental factors, which plays an important role in growth and survival of seedlings. Several growing media or their combinations are being used for raising the seedling. Different growing media like soil, sand, farm yard manure (FYM) and cocopeat either alone or in different proportion have been found beneficial to influence germination and growth of seedling. A good growing media provides sufficient anchorage or support to the plant, serves as a reservoir for nutrients and water, allows oxygen diffusion to the roots and permits gaseous exchange between roots and the atmosphere outside root substrate. The growth substance most commonly used for better germination and rooting for various plant parts are Auxin (IAA, IBA, NAA), Gibbrellic acid (GA_3), etc. Among these GA_3 has proved to be the best for proper germination and seedling growth as well as effectiveness varied according to species. A wide spread use of growth regulators by nurserymen, florist and horticulturist indicates that the growth substance are valuable aid to germination of seed and seedling growth of the plants. These is a great role of various media as well as plant growth regulators particularly GA_3 for seed germination as well as survival seedlings. During seed germinations, the role of GA_3 in the induction of synthesis of α- amylase and other hydrolytic enzymes among monocots and certain dicots is well documented. GA_3 appears mainly to induce the activity of the gluconeogenic enzymes during early stages of seed germinations.

Materials and Methods

The experiment was conducted at the Lalbaugh Farm, Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat) during summer season of the year 2016. Junagadh is situated at 21.5°N latitude and 70.5°E longitude with an altitude of 60 meters above MSL on the western side at the foot hill of mountain Girnar sierra (Gujarat). Climate is typically subtropical, characterized by fairly cool and dry winter, hot and dry summer and warm and moderately humid monsoon. The rainy season commences by third week of June and ends in September. July and August are the months of heavy precipitation. Winter sets in the month of November and continues till the month of February. December and January are the coldest months of winter. Summer commence in the second fortnight of February and ends in the middle of June. April and May are the hottest months.

The treatments comprised of different four level of growing media [M_1 - soil + cocopeat (1:1), M_2 - soil + cocopeat + sand (1:1:1), M_3 - soil + cocopeat + FYM (1:1:1), M_4 - soil + cocopeat + sand + FYM (1:1:1:1)] and different concentration of GA_3 (G_1 - GA_3 100 mg/l, G_2 - GA_3 150 mg/l, G_3 - GA_3 200 mg/l and G_4 – water soaked). There were sixteen treatments combination embedded in a Completely Randomized Block Design (factorial) with three repetitions. The details of the treatments applied in the present investigation are as under:

Sr. No.	Treat. No.	Treat. Combination	Treatment details
1.	T: 1	M_1G_1	Soil + Cocopeat + (1:1) + GA_3 100 mg/l
2.	T: 2	M_1G_2	Soil + Cocopeat + (1:1) + GA_3 150 mg/l
3.	T: 3	M_1G_3	Soil + Cocopeat + (1:1) + GA_3 200 mg/l
4.	T: 4	M_1G_4	Soil + Cocopeat + (1:1) + Water soaked
5.	T: 5	M_2G_1	Soil + Cocopeat + Sand (1:1:1) + GA_3 100 mg/l
6.	T: 6	M_2G_2	Soil + Cocopeat + Sand (1:1:1) + GA_3 150 mg/l
7.	T: 7	M_2G_3	Soil + Cocopeat + Sand (1:1:1) + GA_3 200 mg/l
8.	T: 8	M_2G_4	Soil + Cocopeat + Sand (1:1:1) + Water soaked
9.	T: 9	M_3G_1	Soil + Cocopeat + FYM (1:1:1) + GA_3 100 mg/l
10.	T: 10	M_3G_2	Soil + Cocopeat + FYM (1:1:1) + GA_3 150 mg/l
11.	T: 11	M_3G3	Soil + Cocopeat+ FYM (1:1:1) + GA_3 200 mg/l
12.	T: 12	M_3G_4	Soil + Cocopeat+ FYM (1:1:1) + Water soaked
13	T: 13	M_4G_1	Soil + Cocopeat + Sand + FYM (1:1:1:1:1) + GA_3 100 mg/l
14	T: 14	M_4G_2	Soil + Cocopeat + Sand + FYM (1:1:1:1:1) + GA_3 150 mg/l
15	T: 15	M_4G_3	Soil + Cocopeat + Sand + FYM (1:1:1:1:1) + GA_3 200 mg/l
16	T: 16	M_4G_4	Soil + Cocopeat + Sand + FYM (1:1:1:1:1) + Water soaked

Different growing media were prepared according to proportion of various soil, cocopeat, sand, farm yard manure (FYM) and filled in 15 X 20 cm black polythene bags. Whereas, Gibberellic acid solution of 100, 150 and 200 mg/l were separately prepared by dissolving 100, 150 and 200 mg GA_3. (GA_3 was completely dissolved by addition of small quantity of NaOH pellets) in 1 liter of distill water. Seeds were soaking with different concentration of GA_3 for 24 hours and after sown 1.0 cm deep in the 15 x 20 cm polythene bags filled with prepared media on 22nd April, 2016 at Lalbaugh Farm, Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat). A light irrigation was given immediately after dibbling of seeds in the black polythene bags for proper establishment. Irrigations were given regularly at 7 to 8 days interval depending upon soil moisture status.

Five plants were selected at random from each treatment and tagged for recording the observations. Required observations were recorded from each repetition of different treatments and average value was calculated. The analysis of variance for experimental design was carried out for all the characters under study.

A. Seedling growth parameters

a) Height of seedling (cm)

The height of five tagged seedlings was measured by metric scale from the base of root to the tip of the shoot of the seedling at 60, 90 and 120 days after sowing and average value was calculated.

b) Stem girth of seedling (mm)

The stem girth of five tagged seedlings was measured at 5 cm height above the ground level with the help of vernier callipers at 60, 90 and 120 days after sowing and average value was calculated.

c) Number of leaves per seedling

The number of leaves of five tagged seedlings was counted at 60, 90 and 120 days after sowing and average value was calculated.

d) Leaf area (cm^2)

The leaf area was calculated by portable living leaf area meter (Sunshine Instruments) of five tagged seedling at the 60, 90 and 120 days after sowing and average value was calculated.

e) Number of roots per seedling

The number of roots of five tagged randomly selected seedlings in each treatment was counted at the end of experiment and mean number of roots per seedling was calculated.

f) Root length (cm)

The root length of five tagged seedlings were measured by metric scale from the base of shoot to tip of root at the end of experiment and average value was calculated.

g) Fresh weight of shoot (g)

Five tagged seedlings were selected in each treatment and fresh weight was measured by electronic balance and average weight was calculated.

h) Dry weight of shoot (g)

The dry weight of five tagged seedlings shoots were calculated by drying shoot under shade for three days and then oven dried at 60 °C till the constant weight. The average value was calculated.

i) Fresh weight of root (g)

The fresh weight of five tagged seedlings roots were weighed on digital weighing balance and average value was calculated.

j) Dry weight of root (g)

The dry weight of five tagged seedlings roots were calculated by drying root under shade for three days and then oven dried at 60 °C till the constant weight. The average value was calculated at the end of experiment.

k) Root: Shoot ratio

Root-shoot ratio was calculated by using following formula.

$$\text{Root/Shoot ratio} = \frac{\text{Root biomass (g)}}{\text{Shoot biomass (g)}}$$

Result and Discussion

The experimental findings obtained from the present study have been discussed here in following heads:

Effect on seedling growth parameters

The results presented in Table 1, 2, 3 and 4 clearly shows that the different growing media and different concentrations of GA_3 were significantly affected the seedling growth parameters of custard apple seedling *viz*., height of seedling, stem girth, number of leaves, leaf area, number of roots, root length, fresh weight of shoot, dry weight of shoot, fresh weight of root, dry weight of root and root-shoot ratio.

Effect of media on seedling growth parameters

Among the different media mixture M_4 - soil + cocopeat + sand + FYM (1 : 1 : 1 :1) was found better for growth of seedlings of custard apple (18.80, 38.14 and 50.95 cm), stem girth of seedlings (2.50, 3.55 and 4.71 mm), number of leaves (11.65, 17.67 and 22.68), leaf area (4.10, 7.12 and 12.59 cm^2), number of roots (11.79), root length (17.05 cm), fresh weight of shoot (6.66 g), dry weight of shoot (4.02 g), fresh weight of root (1.28 g), dry weight of root (0.31 g) and root-shoot ratio (0.15).

The increasing seedling growth parameters might be due to combined application of soil, FYM, sand and cocopeat showed significant effect on seedling growth parameters probably due to the synergistic combination of different media mixture in improving the physical conditions of the media and nutritional factors. The conducive effect of media composition on water holding capacity, porosity, soil aeration and supplying substantial amount of nutrient specially nitrogen and micro nutrients for good seedling growth and root growth over soil alone [7] in custard apple. Increase in number of leaves might be mainly due to corresponding increase in plant height [11] in Khasi mandarin. The beneficial effect of media on number of roots, root length and root-shoot ratio might be due to improved soil structure, porosity, water holding capacity, activity of useful soil micro fauna and flora, maintained soil temperature and improved soil health and nutrient status of media [12]. The findings of this experiment are in close conformity of [16] and [2] in papaya, [5] in phalsa. The leaves of seedling raised in this media (M_4), also has due to presence of nitrogen in FYM and cocopeat which might certainly improved the photosynthetic rate, dry matter production and their by more dry weight and fresh weight of

shoot [3]. Therefore, the medium with FYM and cocopeat is more suitable than FYM alone because of the better physical properties and enhanced nutrient level. The results of study are also in close in agreement with the findings of [15] in peach, [22] in pears, [18] in passion fruit, [17] in *Phoebe chekiangensis* and [29] in saru *(Casuarina equisetifolia)*.

Effect of GA_3 on seedling growth parameters

Among the different concentrations of GA_3, G_3 - 200 mg/l was found better for growth of seedlings of custard apple (17.96, 37.72 and 50.71 cm), stem girth of seedlings (2.47, 3.42 and 4.79 mm), number of leaves (11.70, 17.64 and 22.26), leaf area (3.89, 7.00 and 12.52 cm^2), number of roots (11.79), root length (17.02 cm), fresh weight of shoot (6.60 g), dry weight of shoot (3.94 g), fresh weight of root (1.22 g), dry weight of root (0.28 g), root-shoot ratio (0.14).

The increase in seedling height with GA_3 treatments was due to the fact that this hormone increased osmotic uptake of nutrients, causing cell elongation and thus increased height of the plant and stem girth also increased due to greater cell division and elongation at the stem portion [25]. The increase in number of leaves and leaf area might be due to activity of GA_3 at the apical meristem resulting in more synthesis of nucleoprotein responsible for increasing leaf initiation and area. The number of roots, root length and root-shoot ratio increasing due to GA_3 treatment might have resulted into increased production of photosynthates and their translocation through phloem to the root zone might be responsible for increasing the root length [28]. The seeds treated with GA_3 might be accelerates the translocation and assimilation of auxins, reasons for better root growth and vegetative characters are due to overall assimilation and redistribution of materials with in plants enhance the growth attributes. Moreover, GA_3 also induced the activity of gluconeogenic enzymes during early stages of seed germination and vigour characteristic that is reflect in terms of increase in root length. These results are in close agreement with [1] in papaya; [19] in Aonla. Whereas, increase in fresh and dry weight of stem and leaves were due to fact that GA_3 improves the rate of photosynthesis and cause greater accumulation of photosynthates. Such effect is in accordance with the finding of [21] in custard apple, [1], [24] and [4] in papaya, [20] in karonda.

Interaction effect of media and GA_3 on seedling growth parameters

The interaction effect between different media and GA_3 concentrations on seedling growth parameters was found significant except number of roots, root length and root shoot ratio. Among the different combinations of media and GA_3 concentrations, M_4G_3 - soil + cocopeat + sand + FYM (1:1:1:1) with GA_3 200 mg/l was found better for growth of seedlings of custard apple (18.80, 38.14 and 50.95 cm), stem girth of seedlings (2.70, 3.90 and 5.10 mm), number of leaves (12.90, 18.33 and 25.69), leaf area (4.61, 7.83 and 14.39 cm^2), fresh (7.27 g) and dry (4.36 g) weight of shoot, fresh (1.54 g) and dry (0.39 g) weight of root.

The increase in height of seedling with pre-sowing treatments may be due to removal of sarcotesta which induce seed dormancy and reduces the nutrient and water uptake so, minimize the overall growth of the plant. A maximum plant height, plant girth and inter node length were also recorded by [23] in ber. The more plant height, stem diameter and number of leaves observed in M_4G_3 have occurred due to cell division and cell elongation, which in turn would have increased the internodal length and overall vegetative growth as suggested by [8] on Kagzi lime. These types of results were previously noted by [2] and [16] in papaya.

Table 1: Effect of growing media and GA_3 concentrations on height of seedling (cm) and stem girth (mm) of custard apple.

Treatment	Height of seedling (cm)			Stem girth (mm)		
	60 DAS	90 DAS	120 DAS	60 DAS	90 DAS	120 DAS
Media (M)						
M_1- Soil + Cocopeat(1 : 1)	15.14	33.27	45.41	2.09	3.02	3.93
M_2- Soil + Cocopeat + Sand (1 : 1 : 1)	16.28	34.83	47.45	2.20	3.13	4.33
M_3- Soil + Cocopeat + FYM (1 : 1 : 1)	16.94	35.38	49.25	2.38	3.29	4.71
M_4- Soil + Cocopeat + Sand + FYM (1 : 1 : 1 :1)	18.80	38.14	50.95	2.50	3.55	4.72
S. Em±	0.24	0.43	0.58	0.03	0.04	0.06
C.D. at 5%	0.70	1.23	1.66	0.10	0.11	0.18
Gibbrellic acid (G)						
G_1- GA_3 100 mg/l	17.15	36.25	48.34	2.34	3.27	4.50
G_2- GA_3 150 mg/l	17.48	36.50	49.30	2.36	3.35	4.71
G_3- GA_3 200 mg/l	17.96	37.72	50.71	2.47	3.42	4.79
G_4- Water soaked	14.58	31.16	44.71	2.01	2.95	3.69
S. Em±	0.24	0.43	0.58	0.03	0.04	0.06
C.D. at 5%	0.70	1.23	1.66	0.10	0.11	0.18
Interaction (M X G)						
M_1G_1	15.50	34.22	45.70	2.08	3.05	4.00
M_1G_2	15.67	35.33	45.80	2.12	3.09	4.05
M_1G_3	15.83	35.76	46.83	2.17	3.11	4.17
M_1G_4	13.57	27.78	43.30	1.94	2.83	3.50
M_2G_1	16.37	35.33	45.91	2.23	3.15	4.23
M_2G_2	16.87	36.67	47.49	2.20	3.22	4.65
M_2G_3	17.03	36.00	49.82	2.45	3.24	4.80
M_2G_4	14.83	31.33	46.58	1.98	2.90	3.65
M_3G_1	17.50	37.87	49.27	2.43	3.32	5.03
M_3G_2	17.57	35.65	51.07	2.48	3.37	5.06
M_3G3	17.80	37.11	52.40	2.55	3.43	5.07
M_3G_4	14.90	30.89	44.27	2.05	3.03	3.70
M_4G_1	19.23	37.57	52.47	2.60	3.55	4.75

M_4G_2	19.80	38.35	52.83	2.65	3.70	5.08
M_4G_3	21.17	42.00	53.80	2.70	3.90	5.10
M_4G_4	15.00	34.63	44.70	2.05	3.05	3.90
S. Em±	0.48	0.86	1.15	0.07	0.07	0.13
C.D. at 5%	1.39	2.46	3.31	0.19	0.21	0.36
C.V. %	4.98	4.18	4.13	5.11	3.93	4.93

Table 2: Effect of growing media and GA_3 concentrations on number of leaves and leaf area (cm^2) of custard apple

Treatment	Number of leaves			Leaf area (cm^2)		
	60 DAS	90 DAS	120 DAS	60 DAS	90 DAS	120 DAS
Media (M)						
M_1- Soil + Cocopeat(1 : 1)	10.76	16.25	19.25	2.99	5.88	10.39
M_2- Soil + Cocopeat + Sand (1 : 1 : 1)	10.90	16.56	20.30	3.26	6.19	11.31
M_3- Soil + Cocopeat + FYM (1 : 1 : 1)	11.32	16.71	20.82	3.67	6.56	11.78
M_4- Soil + Cocopeat + Sand + FYM (1 : 1 : 1 :1)	11.65	17.67	22.68	4.10	7.12	12.59
S. Em±	0.13	0.15	0.25	0.04	0.06	0.15
C.D. at 5%	0.39	0.43	0.72	0.12	0.19	0.42
Gibbrellic acid (G)						
G_1- GA_3 100 mg/l	11.20	17.22	20.90	3.64	6.60	11.66
G_2- GA_3 150 mg/l	11.23	17.37	21.53	3.81	6.78	11.82
G_3- GA_3 200 mg/l	11.70	17.64	22.26	3.89	7.00	12.52
G_4- Water soaked	10.50	14.95	18.36	2.69	5.37	10.05
S. Em±	0.13	0.15	0.25	0.04	0.06	0.15
C.D. at 5%	0.39	0.43	0.72	0.12	0.19	0.42
Interaction (M X G)						
M_1G_1	10.77	16.57	19.47	3.25	6.21	10.85
M_1G_2	10.77	16.80	20.10	3.27	6.22	10.87
M_1G_3	10.90	17.28	20.17	3.28	6.54	11.45
M_1G_4	10.60	14.33	17.27	2.15	4.53	8.37
M_2G_1	10.97	16.93	20.58	3.38	6.38	11.47
M_2G_2	11.13	17.40	21.07	3.52	6.49	11.66
M_2G_3	11.27	17.23	21.07	3.51	6.50	11.90
M_2G_4	10.23	14.67	18.50	2.64	5.38	10.20
M_3G_1	11.50	17.55	21.20	3.71	6.64	11.92
M_3G_2	11.53	17.40	21.27	4.12	7.05	12.03
M_3G3	11.73	17.71	22.13	4.15	7.13	12.35
M_3G_4	10.50	14.17	18.67	2.70	5.43	10.80
M_4G_1	11.73	17.82	22.35	4.23	7.18	12.41
M_4G_2	11.48	17.89	23.67	4.31	7.34	12.72
M_4G_3	12.90	18.33	25.69	4.61	7.83	14.39
M_4G_4	10.50	16.63	19.00	3.25	6.14	10.83
S. Em±	0.27	0.30	0.50	0.09	0.13	0.29
C.D. at 5%	0.77	0.86	1.43	0.25	0.37	0.84
C.V. %	4.15	3.07	4.15	4.24	3.49	4.41

Table 3: Effect of growing media and GA_3 concentrations on number of roots, root length (cm) and root shoot ratio of custard apple

Treatment	Number of roots	Root length (cm)	Root shoot ratio
Media (M)			
M_1- Soil + Cocopeat (1 : 1)	10.25	16.19	0.11
M_2- Soil + Cocopeat + Sand (1 : 1 : 1)	11.17	16.54	0.12
M_3- Soil + Cocopeat + FYM (1 : 1 : 1)	11.42	16.88	0.14
M_4- Soil + Cocopeat + Sand + FYM (1 : 1 : 1 :1)	11.79	17.05	0.15
S. Em±	0.19	0.22	0.003
C.D. at 5%	0.55	0.62	0.008
Gibbrellic acid (G)			
G_1- GA_3 100 mg/l	11.50	16.83	0.13
G_2- GA_3 150 mg/l	11.67	16.90	0.13
G_3- GA_3 200 mg/l	11.79	17.02	0.14
G_4- Water soaked	9.67	15.91	0.11
S. Em±	0.19	0.22	0.003
C.D. at 5%	0.55	0.62	0.008
Interaction (M x G**)**			
C.D. at 5%	NS	NS	NS
C.V. %	5.93	4.49	7.79

Table 4: Effect of growing media and GA_3 concentrations on fresh weight of shoot (g), dry weight of shoot (g), fresh weight of root (g) and dry weight of root (g), of custard apple

Treatment	Fresh weight of shoot (g)	Dry weight of shoot (g)	Fresh weight of root (g)	Dry weight of root (g)
Media (M)				
M_1- Soil + Cocopeat (1 : 1)	5.63	3.37	0.88	0.18
M_2- Soil + Cocopeat + Sand (1 : 1 : 1)	5.92	3.54	0.94	0.21
M_3- Soil + Cocopeat + FYM (1 : 1 : 1)	6.32	3.81	1.13	0.25
M_4- Soil + Cocopeat + Sand + FYM (1 : 1 : 1 :1)	6.66	4.02	1.28	0.31
S. Em±	0.09	0.04	0.01	0.00
C.D. at 5%	0.25	0.13	0.04	0.01
Gibbrellic acid (G)				
G_1- GA_3 100 mg/l	6.20	3.73	1.11	0.24
G_2- GA_3 150 mg/l	6.40	3.80	1.15	0.26
G_3- GA_3 200 mg/l	6.60	3.94	1.22	0.28
G_4- Water soaked	5.34	3.27	0.75	0.16
S. Em±	0.09	0.04	0.01	0.00
C.D. at 5%	0.25	0.13	0.04	0.01
Interaction (M x G**)**				
M_1G_1	5.50	3.37	0.97	0.18
M_1G_2	5.87	3.42	1.00	0.19
M_1G_3	5.90	3.45	1.02	0.20
M_1G_4	5.25	3.23	0.54	0.15
M_2G_1	5.95	3.55	1.03	0.21
M_2G_2	6.07	3.60	1.06	0.23
M_2G_3	6.25	3.75	1.07	0.23
M_2G_4	5.41	3.25	0.58	0.16
M_3G_1	6.37	3.82	1.14	0.25
M_3G_2	6.57	3.94	1.20	0.28
M_3G3	6.97	4.18	1.25	0.32
M_3G_4	5.35	3.28	0.91	0.17
M_4G_1	6.97	4.18	1.30	0.33
M_4G_2	7.07	4.24	1.32	0.35
M_4G_3	7.27	4.36	1.54	0.39
M_4G_4	5.34	3.30	0.95	0.17
S. Em±	0.17	0.09	0.03	0.01
C.D. at 5%	0.49	0.25	0.08	0.02
C.V. %	4.85	4.11	4.47	4.61

Conclusion

From the present investigation, it can be concluded that soil + cocopeat + sand + FYM (1:1:1:1) media and seed treatment with GA_3 200 mg/l was found superior for seedling growth of custard apple seedling cv. Sindhan.

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