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Original Research Article

Effect of Different Pre-Sowing Treatment on Seed Germination and Growth in Custard Apple (*Annona squmosa*)

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Keywords

Seed germination, Custard apple

A B S T R A C T

The present investigation entitled "Effect of different pre-sowing treatments on seed germination and growth in custard apple (*Annona squamosa* L.)." was carried out at Instructional-cum Research Farm, Department of Horticulture, College of Agriculture, Badnapur, during the year 2015-2016. The experiment was laid out in Randomized Block Design with eight treatments replicated thrice, comprising eight treatments of KNO_3 (0.1%), urea (0.1%), hot water, cold water, thiourea (1.0%), cow urine (10%), cow dung slurry (10.00%) and control. The results of the investigation revealed that, there were significant variations in germination and seedling growth of custard apple due to pre-sowing treatments. Amongst the different treatments, the seed soaked in thiourea (1.0%) solution for 12 hours to sowing resulted in maximum germination percentage (61.65%), however, minimum days required for germination (34.69 days), more number of leaves (4.30, 7.33 and 11.87) maximum stem diameter (0.14, 0.16 and 0.32 mm), maximum height (8.41, 12.93 and 18.36 cm), maximum leaf area (3.95, 16.39 and 30.23 cm^2) at 30, 60 and 90 DAS respectively, maximum fresh weight of seedling (2.88 g), maximum dry weight of seedling (0.75 g), maximum length of root (19.34 cm), maximum primary roots (38.07), maximum secondary roots (33.47), fresh weight of root (0.34 g), dry weight of root (0.12 g) and maximum final survival percentage (97.29 %) was observed under treatment T_5 i.e. thiourea (1%) for 12 hours. The present investigation concluded that the better seed germination and growth of custard apple seedling was observed in treatment T_5 i.e. thiourea (1%) for 12 hours is desirable.

Introduction

Custard apple (*Annona squamosa* L.) is a delicious and important fruit crop which is cultivated in tropical and subtropical climate. It comes under family Annonaceae and native of the West Indies and cultivated since early times throughout Central America to Southern Mexico. The fruit is also popularly known as “Sugar apple”, “Monkey fruit” and “Sweetsop”.

Custard apple is an important dry land fruit of India. Custard apple (*Annona squamosa*) cultivated Balanagar is suitable to grow in dry climate. It can withstand mild frost. The root system is confined to relatively shallow layers and therefore, these do not require deep soils. However, it needs well-drained soil. The trees withstand high amounts of lime found in calcareous soils. It is one of the most drought tolerant fruit trees in India. It is grown in rocky soils. Fruits contains up to 16.5% sugar. Custard apple is free from pests and diseases except mealybugs. It is popular by virtue of its spontaneous spread in forests, wastelands, rocky slopes, and other uncultivated places. Total area of custard apple fruit crop in India is 2010-2011(15,500ha), 2011-2012(19,000ha) and 2012-2013(20,000ha) (Anon, 2013). The custard apple orchards mostly occurred in the parts of Andhra Pradesh, Assam, Bihar, Karnataka, Maharashtra, Madhya Pradesh, Orissa, Rajasthan, and Tamil Nadu as a shrub or hedge plant. The area under custard apple fruit crop in Maharashtra state is 9,424 ha with production 65,968MT, which is 64.45 percent of total area and 65.96 percent of total production in India (Hiwale, 2015). The major area under this crop is scattered in sub mountain area like Beed, Aurangabad, Latur, Usmanabad, Jalna, Parbhani, Nagar, Pune districts. The custard apple leaves are used to reduce blood sugar and oil extracted from seed is used to kill lice. The roots also used in acute dysentery and spinal diseases as well as bark are used for diarrhoea and also use as a tonic.

Bark juice is used as an antidote for snakebite (Amita Arjariya and Kalpana Chaurasia, 2009). Custard apple is one of the most important fruit crop and its area is expanding at a faster rate in recent years. It is mainly propagated by budding and grafting by using rootstock. However, the germination of custard apple seed is very poor and takes long time, very slow growth of seedlings limit its use as rootstock is very much essential to meet the growing demands for budding and grafting. These problems make difficulty in using custard apple as a rootstock. Studies have indicated that use of pre-sowing treatments to improve the germination and subsequent growth of seedlings in many fruits species.

Materials and Methods

The experiment will be conducted at Instructional Cum Research Farm, Department of Horticulture, College of Agriculture, Badnapur, Dist. Jalna. The experiment will be carried out in RBD design with three replications. The seeds will soaked in different concentrations of KNO_3 (0.1%), Urea (0.1%), Hot Water treatment, Cold Water treatment, Thiourea (1%), Cow urine (10%), Cow dung slurry (10%), Control for 12 hrs in beaker. The sinkers were sorted out from the floaters. The seeds will be dry for 10 minutes in shade after soaking. The dried seeds will sown in polythene bags and these polythene bags will be filled with Soil: FYM on 3:1 concentration. Seed germination was calculated as the proportion of germinated seedlings to the number of seeds sown and expressed in terms of percentage.

Results and Discussion

The observations were recorded on various aspects viz., days required for germination, germination percentage, height of seedling, number of leaves, leaf area, stem diameter, fresh weight and dry weight of seedling, root length, primary roots and secondary roots per plant, fresh weight and dry weight of root and final survival percentage of custard apple seedlings. The above observations are presented in this chapter under different headings sub-headings with tables.

Effect of pre-sowing treatments on days required for seed germination and germination percentage at 30 and 90 days

The data presented in Table 1 shows that the minimum days required for seed germination was observed in treatment T_5 (34.69 days) over T_8 (47.86 days) i.e. control treatment. The highest percentage of seed germination T_5 i.e. Thiourea (1%) (50.00 %) at 30 days were statistically at par with each other and (61.65 %) at 90 days was recorded in thiourea for 12 hr and was significantly higher than the rest of the treatments. While, the minimum germination percentage was recorded in T_8 (13.33 %) at 30 days and (38.30 %) at 90 days i.e. control.

Effect of pre-sowing treatments on growth of seedling

The periodic observations on the height of seedling, stem diameter, leaves per seedling, leaf area of seedling at 90 DAS under various treatments were recorded and data is presented in Table 2. The data in respect of the height of seedling at 90 DAS was significantly influenced by pre-sowing treatments. The data indicated that the maximum seedling growth was recorded in treatment T_5 i.e. Thiourea (1%) for 12 hr and it was statistically at par with T_7, T_6 and significantly maximum growth of seedling than rest of other treatments at 90 DAS.

Effect of pre-sowing treatments on fresh weight and dry weight of seedling

The significantly maximum fresh weight of seedling (2.88 g) and dry weight of seedling (0.75 g) was recorded under treatment T_5 i.e. Thiourea (1%) for 12 hr and significantly higher than the rest of treatments.

While, the minimum fresh weight of seedling (1.77 g) and dry weight of seedling (0.31 g) in the treatment control T_8 at 90 days after sowing.

Effect of pre-sowing treatments on root growth of seedling

The periodic observations of the primary roots, secondary roots, root length, fresh weight of root, dry weight of root per plant at 90 DAS under various treatments were recorded and data is presented in table 3. The revealed that the maximum roots growth per plant was recorded in T_5 i.e. Thiourea (1%) for 12 hr and it was significantly different over other treatments.

Table.1 Effect of pre-sowing treatments on days required for seed germination and germination percentage at 30 and 90 days

Tr. no.	Treatments	Days required for seed germination	Seed germination % 30 DAS	Seed germination % 90 DAS
T_1	KNO_3 (0.1%)	37.97	30.00 (33.21)	55.00 (47.87)
T_2	Urea (0.1%)	41.49	20.00 (26.57)	43.30 (41.15)
T_3	Hot Water	38.30	26.66 (31.09)	53.30 (46.89)
T_4	Cold Water	40.70	20.00 (26.57)	53.30 (46.89)
T_5	Thiourea (1%)	34.69	50.00 (45.00)	61.65 (51.74)
T_6	Cow urine (10%)	36.81	33.33 (35.26)	56.65 (48.82)
T_7	Cow dung slurry (10%)	35.61	43.33 (41.17)	58.30 (49.78)
T_8	Control	47.86	13.33 (21.41)	38.30 (38.23)
S.Em.±		3.99	0.22	0.65
C.D. at 5 %		NS	0.68	1.98

***** Figures in parenthesis denote the arc sign transformation value.

Table.2 Effect of pre-sowing treatments on growth of seedling at 90 DAS

Tr. no.	Treatments	Height of seedling (cm)	Diameter of the stem	Number of leaves per seedling	Leaf area (cm^2)
T_1	KNO_3 (0.1%)	16.73	0.29	10.93	28.35
T_2	Urea (0.1%)	15.20	0.26	10.27	22.69
T_3	Hot Water	16.60	0.28	10.40	25.32
T_4	Cold Water	15.57	0.27	10.33	24.54
T_5	Thiourea (1%)	18.36	0.32	11.87	30.23
T_6	Cow urine (10%)	17.33	0.30	11.20	26.89
T_7	Cow dung slurry (10%)	17.80	0.30	11.60	27.38
T_8	Control	14.97	0.25	10.00	20.04
S.Em.±		1.02	0.02	0.70	1.68
C.D. at 5 %		NS	NS	NS	5.09

Table.3 Effect of pre-sowing treatments on growth of seedling at 90 DAS

Tr. no.	Treatments	Fresh wt. of seedling (g)	Dry wt. of seedling (g)	Primary roots per plant	Secondary roots per plant	Length of root (cm)	Fresh wt. of root (g)	Dry wt. of root (g)	Survival %
T1	KNO_3 (0.1%)	1.57	0.55	32.27	26.13	17.51	0.24	0.07	90.90 (72.44)
T2	Urea (0.1%)	1.19	0.31	28.33	20.40	14.30	0.17	0.04	76.92 (61.29)
T3	Hot Water	1.36	0.48	31.00	24.60	15.13	0.19	0.06	90.62 (72.17)
T4	Cold Water	1.31	0.40	29.27	23.37	14.27	0.18	0.05	81.25 (64.34)
T5	Thiourea (1%)	2.88	0.75	38.07	33.47	19.34	0.34	0.12	97.29 (80.52)
T6	Cow urine (10%)	2.05	0.58	32.80	27.73	15.23	0.29	0.08	91.17 (72.71)
T7	Cow dung slurry (10%)	2.35	0.63	33.60	32.40	15.66	0.30	0.10	91.42 (72.97)
T8	Control	1.77	0.31	27.53	20.27	13.53	0.17	0.03	60.86 (51.27)
S.Em.±		0.21	0.05	2.47	0.84	1.77	0.02	0.00	0.12
C.D. at 5 %		0.63	0.16	NS	2.54	NS	0.05	0.01	0.36

Effect of pre-sowing treatments on final survival percentage

The result revealed that the maximum survival percentage (97.29%) recorded in T_5 i.e. Thiourea (1%) for 12 hr and which was significantly higher than the over rest of other treatments. While, the minimum survival percentage value was recorded in T_8 (60.86 %) i.e. control. The experiment entitled "Effect of different pre-sowing treatments on seed germination and growth in custard apple (*Annona squamosa* L.)." was carried out during 2015-16, at Department of Horticulture, College of Agriculture, Badnapur. The objectives framed were concentrated to identify suitable treatment for better growth of custard apple seedlings. The results obtained during the course of investigation are discussed in this chapter under appropriate headings.

Thiourea treatments significantly influenced the seed germination percentage and growth parameters viz. number of leaves, stem diameter, height of seedling, leaf area, fresh and dry weight of seedling, root length, primary roots and secondary roots, fresh and dry weight of root and final survival percentage. The pronounced effect of thiourea on growth characters might be attributed due to its dormancy breaking and germination stimulating effects, it appears to have more divers biological activities because of its sulf hydral group. Thiourea with its sulf hydral group not only favored larger green photosynthetic surface but it might have also favored the activity of starch synthetase and hence the effective period of filling seeds. Significant increase enhanced photosynthetic efficiency. In the present study thiourea also, maintained large no. of green leaves such effects of thiourea might have favoured canopy photosynthesis and hence large accumulating of photosynthate during seed development. These observations are also supported by the results for application of thiourea also creates lighter microbial population in soil which is responsible for mobilizing essential nutrients and improves the growth plants. The beneficial effect of thiourea on seed germination, seedling growth and chlorophyll content, protein content, biomass production and better dry matter partitioning. These observations are also supported by the result of Anitha *et al.*, Thus thiourea application favorably affects both carbohydrates and nitrogen metabolism which in turn enhance plant performance. The thiourea treatments significantly increase chlorophyll content in leaves. Thiourea implying its favorable impact on photosynthetic production and its partitioning.

The increase in number of leaves with thiourea treatment may be due seeds germination can be attributed to a reduction of the preventive effect of seed coat and its cytokine activity in overcoming inhibition. The above results are conformity with Dhankhar and Singh (1996) in Aonla, Cetimbas and Koyuncu (2006) in *Prunus avium* L. seeds.

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