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Effect of seed treatment on germination of custard apple (*Annona squamosa* L.)

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Abstract

The present investigation "Effect of Seed Treatment on Germination of Custard Apple (*Annona squamosa* L.)" was laid out on the experimental site of Department of Horticulture, Sam Higginbottom University of Agriculture Technology & Sciences, Naini, Pryagraj (UP),during 2023-2024. The experiment was carried out in Completely Randomized design with 10 treatment which were replicated thrice. The treatments were T_0 (Control), T_1 (200 ppm GA_3),T_2 (300 ppm GA_3),T_3 (400 ppm GA_3),T_4 (500 ppm GA_3),T_5 (600 ppm GA_3),T_6 (KNO_3 (2%)),T_7 (KNO_3 (1%)),T_8 (Thiourea @ 0.5%),T_9 (Thiourea @ 1%). From the present experimental finding it was concluded that the treatment T_4 (GA_3 @ 500 ppm) was found to be best in the terms of germination percentage, days to germination, number of leaves, shoot and root length, sapling length, of seedling.

Keywords: Custard apple, GA3, KNO3, thiourea, germination

Introduction

The custard apple, a tropical treat with a name that perfectly describes its texture, is a hidden gem of the fruit world. Native to the Americas and Caribbean, this sweet surprise comes from several species of Annona trees. The most common varieties include the cherimoya, known for its heart-shaped form and delicate flavor; the soursop, with its spiky green skin and tangy flesh; and the custard apple itself (also called bullock's-heart), boasting a lumpy brown exterior and creamy, custard-like interior.

Despite their diverse appearances, custard apples share some key characteristics. Their bumpy skin, often green or brown, gives way to a soft, white or yellow flesh with a unique texture – think of a spoon gliding effortlessly through soft cream. The flavor is where the magic happens. Custard apples offer a burst of sweetness, sometimes with hints of citrus, banana, or pineapple. However, be warned – those dark, glossy seeds nestled within the flesh are inedible.

Gibberellic acid (GA3), a plant hormone, has emerged as a valuable tool in seed treatment for many crops, including potentially custard apple. This naturally occurring compound plays a crucial role in seed germination by overcoming dormancy and stimulating various growth processes. Breaking dormancy: Seeds often have dormancy mechanisms to prevent germination under unfavorable conditions.

Potassium nitrate (KNO_3) plays a significant role in enhancing seed germination, acting as a chemical trigger that breaks seed dormancy and stimulates early growth. This compound provides essential potassium and nitrate ions, which are critical for the metabolic processes in seeds. Potassium aids in osmoregulation and enzyme activation, both vital for cell elongation and division during germination.

Thiourea, a sulfur-containing organic compound, plays a crucial role in enhancing the germination of custard apple (*Annona squamosa*) seeds. Custard apple seeds are notorious for their hard seed coats and inherent dormancy, leading to prolonged and uneven germination. Thiourea addresses these challenges effectively by breaking the dormancy and promoting faster, more uniform germination.

Materials and Methods

The present investigation "Effect of Seed Treatment on Germination of Custard Apple (*Annona squamosa* L.)" was laid out on the experimental site of Department of Horticulture, Sam Higginbottom University of Agriculture Technology & Sciences, Naini, Pryagraj (UP),during 2023-2024. The experiment was carried out in Completely Randomized design with 10 treatment which were replicated thrice. The treatments were T_0 (Control), T_1 (200 ppm GA_3), T_2 (300 ppm GA_3), T_3 (400 ppm GA_3), T_4 (500 ppm GA_3), T_5 (600 ppm GA_3), T_6 (KNO_3 (2%)), T_7 (KNO_3 (1%)), T_8 (Thiourea @ 0.5%), T_9 (Thiourea @ 1%). The present study was carried out with the objective to asses the effect of seed treatment on its inclusive performance.

Results and Discussion

The minimum days taken for seed germination was obtained in the treatment T_9 (Thiourea @ 1%) with 29.13 days followed by treatment T_3 (GA_3 @ 400 ppm) with 29.49 days which was statistically superior over control T_0 (Control) with 38.00 days. Thiourea, a sulfur-containing compound, can significantly enhance the germination of custard apple (*Annona squamosa*) seeds. Pre-treating these seeds with thiourea solutions accelerates germination by breaking seed dormancy and improving water uptake.

The maximum germination percentage was obtained in the treatment T_4 (GA_3 @ 500 ppm) with 86.67% followed by treatment T_9 (Thiourea @ 1%) with 83.33% which was statistically superior over control T_0 (Control) with 67.49%. Thiourea and gibberellic acid (GA_3) significantly accelerate the germination of custard apple (*Annona squamosa*) seeds. Thiourea breaks seed dormancy and enhances water absorption, leading to faster sprouting. GA_3, a plant growth hormone, promotes cell elongation and enzyme activation, facilitating quicker seedling emergence.

The maximum number of leaves was obtained in the treatment T_4 (GA_3 @ 500 ppm) with 7.63 followed by treatment T_9 (Thiourea @ 1%) with 7.12 which was statistically superior over control T_0 (Control) with 5.58. Thiourea treatment enhances the growth of custard apple (*Annona squamosa*) seedlings by increasing the number of leaves. Applied typically at 0.5-1% concentration, thiourea accelerates germination and boosts early seedling vigor. This growth-promoting effect is attributed to thiourea's ability to stimulate cellular activities and hormonal balance, facilitating better nutrient absorption and improved shoot development.

The maximum Shoot length was obtained in the treatment T_4 (GA_3 @ 500 ppm) with 6.63 cm followed by treatment T_9 (Thiourea @ 1%) with 6.11 cm which was statistically superior over control T_0 (Control) with 4.88 cm. Thiourea and gibberellic acid (GA_3) significantly enhance the shoot length of custard apple (*Annona squamosa*) seedlings. Thiourea, at concentrations of 0.5-1%, promotes early seedling vigor by breaking dormancy and improving nutrient uptake. Together, these treatments synergize to produce longer shoots compared to untreated seedlings.

The maximum Root length was obtained in the treatment T_4 (GA_3 @ 500 ppm) with 23.14 cm followed by treatment T_9 (Thiourea @ 1%) with 21.66 cm which was statistically superior over control T_0 (Control) with 15.66 cm. GA_3, a plant hormone, further accelerates these processes by enhancing cell elongation and stimulating the synthesis of enzymes that break down complex carbohydrates into simpler sugars, providing energy for root growth. At the cellular level, GA_3 increases the plasticity of cell walls and promotes mitotic activity in root meristems.

The maximum Sapling Length was obtained in the treatment T_4 (GA_3 @ 500 ppm) with 61.63 cm followed by treatment T_9 (Thiourea @ 1%) with 56.07 cm which was statistically superior over control T_0 (Control) with 37.56 cm. Thiourea's sulfur content plays a role in synthesizing amino acids and proteins, crucial for new cell formation and growth. Moreover, thiourea modulates phytohormones like auxins and gibberellins, which are critical for cell expansion and elongation. By improving water uptake and nutrient assimilation, thiourea ensures that cells can grow larger and proliferate faster, resulting in longer shoots and roots, thereby promoting overall seedling elongation.

Table 1: The minimum days taken for seed germination was obtained in the treatment

Symbol	Treatment	Days to Germination	Germination%	No. of leaves	Shoot length (cm)	Root length (cm)	Sapling length (cm)
T_0	Control	38.00	67.49	5.58	4.88	15.86	37.56
T_1	200 ppm GA_3	33.70	71.00	5.79	5.01	18.78	45.66
T_2	300 ppm GA_3	34.87	77.33	6.23	5.51	18.82	48.88
T_3	400 ppm GA_3	29.49	81.00	6.44	5.78	20.74	50.55
T_4	500 ppm GA_3	31.73	86.67	7.63	6.63	23.14	61.63
T_5	600 ppm GA_3	31.87	77.07	6.73	5.82	19.58	49.57
T_6	KNO_3 (2%)	37.19	76.67	6.81	5.99	19.41	52.99
T_7	KNO_3 (1%)	33.93	76.19	6.29	5.73	18.82	50.75
T_8	Thiourea @ 0.5%	34.28	79.33	6.38	5.82	19.38	53.49
T_9	Thiourea @ 1%	29.13	83.33	7.12	6.11	21.66	56.07
	F Test	S	S	S	S	S	S
	$S.Ed_{\pm}$	0.56	1.40	0.16	0.12	0.35	0.12
	$CD_{@5\%}$	1.20	2.98	0.34	0.27	0.75	0.27
	CV	2.08	2.22	3.10	2.75	2.23	2.75

Conclusion

From the present experimental finding it was concluded that the treatment T_4 (GA_3 @ 500 ppm) was found to be best in the terms of germination percentage, days to germination, number of leaves, shoot and root length, sapling length.

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