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Effect of seed treatment on seedling growth and survival under net house condition in papaya (*Carica papaya* L.) cv. Red Baby

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Abstract

The present investigation was carried out during the year 2023-24 at Central Nursery Scheme, Vasant Rao Naik Marathwada Krishi Vidyapeeth Parbhani Maharashtra. The experiment was seed treatment of different organics and plant growth regulators on papaya to study effect on germination and survival. The results revealed that, application of GA₃ @ 250 ppm shows best performance in growth parameters such as shoot height (13.16 cm, 22.53 cm and 31.77 cm), number of leaves (5.63, 9.23 and 13.80), stem diameter (3.37 mm, 4.44 mm and 5.86 mm) at 30, 45 and 60 DAS respectively. The leaf area (159.73 cm²), chlorophyll content (60.72 SPAD unit), fresh weight (15.26 g), dry weight of sapling (1.80 g), seed vigour index-I (2912.25), and seed vigour index-II (165.06) at 60 DAS were also observed best under this treatment. While lowest Incidence of damping off (3.60%) and mortality percentage (3.60) and highest survival percentage (96.39) were observed in seed soaking in cow urine (10%) for 12 hr + Azotobacter @ 0.2 ml/10 g treatment.

Keywords: Papaya, gibberellic acid, cow urine, Azotobacter, PSB

Introduction

Papaya (*Carica papaya* L.) is an important fruit crop in the world's tropical and subtropical climates and has been known as wonder fruits of tropics. It is originated from tropics of America. Papaya is an evergreen plant with a hallow, softwood stem and generally unbranched. According to National Horticulture Board 2021-22 (1st Adv. Estimate) the total area under papaya cultivation is about 1.48 lakh ha while total production is estimated to be about 5.74 million tonnes. In India major papaya producing states are Andhra Pradesh, Gujarat, Maharashtra, Karnataka, Madhya Pradesh, and Chhattisgarh. It is very refreshing and delicious fruit with excellent digestive characteristics. Meena *et al.* (2017) [9] also claimed that papaya juice functions as an *in-vitro* antiproliferative against liver cancer cells since it contains caricaxanthin and lycopene.

Papaya plants are exclusively grown from seeds, making strong seedlings vital for successful cultivation. However, papaya seeds have a reputation for poor germination, with slow, uneven and incomplete sprouting (Chacko and Singh, 1966) [5]. The seed's outer coating, called the sarcotesta, hinders germination. Various factors, including oxygen, temperature, species, water, growth regulators and radiation impact seed consistency. Fortunately, pre-soaking seeds can improve germination by removing inhibiting coverings, promoting healthier seedlings. Cow urine is considered a distinct and nutrient-rich substance, Gibberellins have a role in the mobilization of seed reserves during the germination process. Gibberellins are therefore significant germination promoters that increase seed germination and uniformity, which enhances the performance of papaya seeds (Zanotti *et al.* 2014) [11]. During the germination process, phytohormones such as gibberellins mobilize seed reserves, and auxins (NAA) promotes root growth and development. The problem of uneven germination is reported by papaya growers in Marathwada region of Maharashtra. Keeping the above fact in view, present investigation was undertaken with an object to study the effect of organics and plant growth regulators on seed germination, growth and survival of seedlings in papaya.

Materials and Methods

The experiment “Effect of seed treatment on seed germination and seedling growth under net house condition on papaya (*Carica papaya* L.) cv. Red Baby.” was carried out during the year 2023-24. The experiment was laid out in randomized block design with three replication. The experiment comprised of fourteen treatment consisting of four organics and two plant growth regulators and three combinations of organics. All PGR were used in different concentration. *Viz.* T₁-Seed soaking in Azotobacter @ 0.2 ml/10 g seeds, T₂-Seed soaking in PSB @ 0.2 ml/10 g of seeds, T₃-Seed treated with Biomix @ 0.1 g/10 g of seeds, T₄-Seed soaking in cow urine (10%) soaking for 12 hr, T₅-Seed soaking in cow urine (10%) for 12 hr + Azotobacter @ 0.2 ml/10 g of seeds, T₆-Seed soaking in cow urine (10%) for 12 hr + PSB @ 0.2 ml/10 g of seeds, T₇-Seed soaking in cow urine (10%) for 12 hr + Biomix @ 0.1 g/10 g of seeds, T₈ - Seed soaking in GA₃ @ 150 ppm for 12 hr, T₉-Seed soaking in GA₃ @ 150 ppm for 12 hr, T₁₀- Seed soaking in GA₃ @ 250 ppm for 12 hr, T₁₁- Seed soaking in NAA @ 200 p pm for 12 hr, T₁₂- Seed soaking in NAA @ 300 ppm for 12 hr, T₁₃-Seed soaking in NAA @ 400 ppm for 12 hr and T₁₄- Control. The seeds were sown in polybags with growing media Soil: Sand: FYM (1:1:1). The data for growth parameter and survival percentage were recorded and statistically analysed.

Results and Discussions

Growth parameters

Height of Shoot

The height of shoot was significantly influenced by various treatments used during the period (at 30, 45 and 60 DAS) of experiment. The treatment T₁₀, GA₃ @ 250 ppm showed significantly maximum height of shoot (13.16 cm, 25.53 cm, 31.77 cm height of shoot) at 30, 45 and 60 DAS respectively. However, treatment T₁₄, control exhibited minimum shoot height (8.23 cm, 15.33 cm, 23.51 cm respectively) during same period.

The maximum seedling height in GA₃ treated seeds might be due to the effect of gibberellic acid, which enhances the osmotic uptake of nutrients, leading to increased cell multiplication and elongation. This process results in greater internodal length and, consequently, an increase in plant height (Dohono and Walker, 1957) [8]. These results are in conformity with Barche *et al.* (2010) [3] in papaya.

Number of Leaves

The number of leaves was significantly influenced by different treatments during 30, 45 and 60 DAS. The treatment T₁₀, seed soaking in GA₃ @ 250 ppm for 12 hr reported maximum number of leaves per seedlings (5.63, 9.23, 13.80 respectively). While the treatment T₁₄ - control showed lowest number of leaves per seedling (3.70, 7.57, 9.07 respectively). The maximum number of leaves in GA₃ treated seeds was likely due to enhanced cell division and elongation, which increased the number of leaves per seedling. Similar results were reported by Anjanawe *et al.* (2013) [1], Ashish *et al.* (2022) [1] in papaya.

Stem Diameter

The stem diameter was significantly influenced by different treatments during 30, 45 and 60 DAS. The stem diameter (3.7 mm, 4.44 mm, 5.86 mm) was observed largest in

treatment T₁₀, GA₃ @ 250 ppm at 30, 45, 60 days after sowing respectively. However, the treatment T₁₄, control disclosed stem diameter (1.79 mm, 2.21 mm, 3.66 mm) respectively.

The largest stem diameter was observed with the GA₃ @ 250 ppm treatment. This effect is likely due to GA₃ plays a crucial role in stimulating cambium and its immediate cell progeny, as noted by Dhankhar and Singh (1996) [7] in aonla. The above results are consistent with the results reported by Desai *et al.* (2017) [6] in papaya.

Leaf Area

Among the various treatments, the maximum area of leaf (159.73 cm²) was noted under the treatment T₁₀, seeds soaking in GA₃ @ 250 ppm for 12. Whereas a treatment T₁₄, control showed a minimum leaf area (117.84 cm²) at 60 DAS. The increase in the number of leaves and leaf area following GA₃ application may be attributed to the effect of GA₃ on the apical meristem, which enhances the activity of nucleoproteins responsible for promoting leaf initiation and expansion. This finding is supported by Meena and Jain (2012) [10] in their study on papaya.

Chlorophyll Content

The highest chlorophyll content (60.62 SPAD unit) in leaves was noticed under the treatment T₁₀, seeds soaking in GA₃ @ 250 ppm for 12 hr. While, the treatment T₁₄, control exhibited a lowest chlorophyll content (46.55 SPAD unit) among the all treatments. This might be due to gibberellic acid (GA₃) has been documented to positively affect chlorophyll content through its impact on chlorophyll biosynthesis and its role in delaying leaf senescence.

Fresh Weight of Shoot

The highest fresh weight (15.26 g) was achieved with treatment T₁₀, seeds soaking in GA₃ @ 250 ppm for 12 hr. In contrast, the lowest fresh weight (12.09 g) was observed in the control treatment T₁₄. The application of GA₃ helps mobilization of water and nutrients at a higher rate may have promoted increased production of photosynthetic products, which were then transported to various plant parts. This likely resulted in improved seedling growth and consequently a higher fresh weight. The result with confiromity with the finding of Dhankar and Singh (1996) [7] in aonla

Dry Weight of Shoot

The highest dry weight (1.80 g) was achieved with treatment T₁₀, seeds soaking in GA₃ @ 250 ppm for 12 hr. However, the lowest dry weight (1.25 g) was observed in the control treatment T₁₄. The application of GA₃ helps mobilization of water and nutrients at a higher rate may have promoted increased production of photosynthetic products, which were then transported to various plant parts. This likely resulted in improved seedling growth and consequently a higher fresh weight. The result with confiromity with the finding of Dhankar and Singh (1996) [7] in aonla

Seed Vigour Index –I

The observations indicated that the highest seedling vigour index-I (2912.25 cm) was recorded with seeds soaking in GA₃ @ 250 ppm for 12 hr (T₁₀). The lowest seedling vigour Index-I (1606.29 cm) was noted in the control treatment,

T₁₄. The vigor index of seedlings is directly related to germination percentage and seedling length.

Seed Vigour Index – II (g)

The observations indicated that the highest seedling vigour index-II (165.06 g) was recorded with seeds soaking in GA₃ @ 250 ppm for 12 hr (T₁₀). While, the lowest seedling vigour Index-I (1606.29 g) was noted in the control treatment, T₁₄. The increase in vigor index observed with GA₃ treated seeds may be due to its direct effect on enhanced seedling growth, likely through increased mobilization of reserve nutrients to the growing apices.

Incidence of Damping off

The treatment T₅, seeds soaking in cow urine (10%) for 12 hr + Azotobacter @ 0.2 ml showed the lowest incidence of damping off (3.60%). Which is statistically non-significant with other treatment. However, the treatment T₁₄, control which reported the maximum percentage of incidence of damping off (12.08%).

Mortality percentage

The treatment T₅, seed soaking in cow urine (10%) for 12 hr + Azotobacter @ 0.2 ml showed the lowest mortality percentage (3.60%) which is statistically non-significant with other treatments. While, the treatment T₁₄, control reported the maximum mortality percentage (14.47%)

Survival percentage

As per the observations recorded, the treatment T₅, seed soaking in cow urine (10%) for 12 hr + Azotobacter @ 0.2 ml/ 10 g seeds showed the maximum survival percentage (96.39%). While, the treatment T₁₄, control reported the maximum survival percentage (85.53%) Survival percentage is maximum because Cow urine and Azotobacter enriches the soil with essential nutrients such as nitrogen, phosphorus, and potassium, which are crucial for seedling growth and development. This increased nutrient availability supports robust seedling growth, leading to higher survival rates. These similar results are consistent with the findings of references of Bhardwaj (2013) ^[4].

Tr. No.	Treatments	Height of shoot (cm)			Number of leaves			Stem diameter (cm)			Leaf area (cm ²)	Chlorophyll Content (SPAD unit)
		30 DAS	45 DAS	60 DAS	30 DAS	45 DAS	60 DAS	30 DAS	45 DAS	60 DAS		
T ₁	Seed soaking in Azotobacter @ 0.2 ml/10 g seed	10.60	17.76	27.27	4.08	7.77	10.07	2.10	2.94	4.18	135.31	53.33
T ₂	Seed soaking in PSB @ 0.2 ml/10 g of seeds	10.00	17.24	26.45	4.12	8.03	10.43	2.12	3.00	4.20	135.38	53.75
T ₃	Seed treated with Biomix @ 0.1 g/10 g of seeds	10.33	17.68	26.77	4.00	7.77	9.17	1.98	2.91	3.98	129.61	53.03
T ₄	Seed soaking in cow urine (10%) for 12 hr	10.88	17.89	27.47	4.33	8.23	10.47	2.15	3.00	4.22	136.78	53.89
T ₅	Seed soaking in cow urine (10%) for 12 hr + Azotobacter @ 0.2 ml/10 g	12.13	20.19	29.79	5.18	8.62	12.27	2.81	3.84	5.03	146.93	57.11
T ₆	Seed soaking in cow urine (10%) for 12 hr + PSB @ 0.2 ml/10 g of seeds	11.13	19.23	28.16	4.89	8.47	11.30	2.27	3.25	4.37	140.77	55.46
T ₇	Seed soaking in cow urine (10%) for 12 hr + Biomix @ 0.1 g/10 g of seeds	11.00	19.10	27.70	4.70	8.40	11.17	2.26	3.19	4.35	138.83	54.89
T ₈	Seed soaking in GA ₃ @ 150 ppm for 12 hr	11.97	19.33	29.26	5.20	8.70	12.60	3.19	4.12	5.61	147.60	58.54
T ₉	Seed soaking in GA ₃ @ 200 ppm for 12 hr	12.50	21.70	31.28	5.30	8.80	12.90	3.25	4.27	5.68	155.85	60.37
T ₁₀	Seed soaking in GA ₃ @ 250 ppm for 12 hr	13.16	22.53	31.77	5.63	9.23	13.80	3.37	4.44	5.86	159.73	60.72
T ₁₁	Seed soaking in NAA @ 200 ppm for 12 hr	11.53	19.29	29.25	4.55	8.27	11.10	2.21	3.08	4.26	138.06	54.61
T ₁₂	Seed soaking in NAA @ 300 ppm for 12 hr	12.03	19.62	29.64	5.00	8.50	12.13	2.35	3.34	4.51	144.68	55.81
T ₁₃	Seed soaking in NAA @ 400 ppm for 12 hr	12.46	20.25	30.55	5.07	8.57	12.17	2.73	3.74	4.70	146.50	56.21
T ₁₄	Control	8.23	15.33	23.51	3.70	7.57	9.07	1.79	2.21	3.66	117.84	46.55
	S.E.m.±	0.37	0.90	1.03	0.16	0.22	0.53	0.08	0.11	0.09	4.80	0.85
	C.D. at 5%	1.07	2.62	2.99	0.46	0.63	1.53	0.24	0.32	0.26	13.96	2.47

Tr. No.	Treatments	Fresh weight of shoot (g)	Dry weight of shoot (g)	Seed Vigour Index –I (cm)	Seed Vigour Index –II (g)	Incidence of damping off (%)	Mortality percentage (%)	Survival Percentage (%)
T ₁	Seed soaking in Azotobacter @ 0.2 ml/10 g	13.31	1.46	2135.89	114.58	7.96	11.56	88.44
T ₂	Seed soaking in PSB @ 0.2 ml/10 g of seeds	13.34	1.39	1983.75	111.48	7.85	11.51	88.49
T ₃	Seed treated with Biomix @ 0.1 g/10 g of seeds	13.19	1.46	2096.72	114.00	7.75	11.30	88.70
T ₄	Seed soaking in cow urine (10%) for 12 hr	13.51	1.51	2197.33	120.96	6.25	8.00	92.00
T ₅	Seed soaking in cow urine (10%) for 12 hr + Azotobacter @ 0.2 ml/10 g	14.44	1.64	2533.85	139.12	3.60	3.60	96.39
T ₆	Seed soaking in cow urine (10%) for 12 hr + PSB @ 0.2 ml/10 g of seeds	14.11	1.56	2393.88	132.18	4.17	5.28	94.72
T ₇	Seed soaking in cow urine (10%) for 12 hr + Biomix @ 0.1 g/10 g of	13.94	1.55	2216.00	124.13	6.00	7.97	92.03
T ₈	Seed soaking in GA ₃ @ 150 ppm for 12 hr	14.80	1.67	2438.33	139.56	6.26	8.77	91.23
T ₉	Seed soaking in GA ₃ @ 200 ppm for 12 hr	14.83	1.70	2659.08	144.10	5.77	7.64	93.52
T ₁₀	Seed soaking in GA ₃ @ 250 ppm for 12 hr	15.26	1.80	2912.25	165.06	4.18	6.14	93.86
T ₁₁	Seed soaking in NAA @ 200 ppm for 12 hr	13.68	1.51	2389.02	123.51	7.67	10.45	89.55
T ₁₂	Seed soaking in NAA @ 300 ppm for 12 hr	14.35	1.62	2469.72	135.39	5.78	7.75	92.36
T ₁₃	Seed soaking in NAA @ 400 ppm for 12 hr	14.43	1.63	2545.56	136.08	4.46	6.39	93.61
T ₁₄	Control	12.09	1.25	1606.29	74.83	12.08	14.47	85.53
	S.E.m.±	0.20	0.03	130.37	5.64	2.07	2.11	2.04
	C.D. at 5%	0.59	0.10	379.06	16.40	NS	NS	5.94

Conclusions

In the current experiment, the treatment of seeds soaking in GA₃ @ 250 ppm for 12 hr resulted seedling growth parameters such as shoot height, number of leaves, stem diameter, leaf area, chlorophyll content, fresh and dry weight of saplings, seed vigour index I and seed Vigour index II and while, the maximum survival percentage was achieved with application of seed soaking in cow urine (10%) for 12 hr + Azotobacter @ 0.2 ml/10 g of seeds.

References

1. Anjanawe SR, Kanpure RN, Kachouli BK, Mandloi DS. Effect of plant growth regulators and growth media on seed germination and growth vigour of papaya. *Annals of Plant and Soil Research*. 2013;15(1):31-34.
2. Ashish DDP, Panigrahi HK, Tani M. Studies on the influence of plant growth regulators and bio-inoculants on seed germination and seedling growth of papaya (*Carica papaya* L.) cv. Red Lady under net tunnel. *The Pharma Innovation Journal*. 2022;11(9):1980-1985.
3. Barche S, Singh K, Singh DB. Response of seed treatment on germination, growth, survivability and economics of different cultivars of papaya (*Carica papaya* L). *Acta Hort*. 2010;851:279-281.
4. Bhardwaj RL. Effect of growing media on seed germination and seedling growth of papaya cv. Red Lady. *Indian Journal of Agriculture Research*. 2013;47(2):163-168.
5. Chacko EK, Singh RN. The effect of gibberellic acid on the germination of papaya seeds and subsequent seedling growth. *Tropical Agriculture*. 1966;4(3):341-346.
6. Desai A, Trivedi A, Panchal B, Desai V. Improvement of papaya seed germination by different growth regulator and growing media under net house condition. *International Journal of Current Microbiology and Applied Sciences*. 2017;6(9):828-834.
7. Dhankhar DS, Singh M. Seed germination and seedling growth in aonla (*Phyllanthus emblica* Linn.) as influenced by gibberellic acid and thiourea. 1996.
8. Dohono W, Walker DR. Effect of gibberellic acid on breaking of rest period in Elberta peach. *Science*. 1957;126:1178-1179.
9. Meena AK, Garhwal OP, Mahawar AK, Singh SP. Effect of different growing media on seedling growth parameters and economics of papaya (*Carica papaya* L) cv. Pusa delicious. *International Journal of Current Microbiology and Applied Sciences*. 2017;6(6):2964-2972.
10. Meena RR, Jain MC. Effect of seed treatment of gibberellic acid on growth parameters of papaya seedlings. *Progress Horticulture*. 2012;44(2):248-250.
11. Zanotti RF, Dias DCF, Barros RS, Silva LJ, Sekita MC. Germination of "Solo" papaya seeds treated with plant hormones. *Journal of Seed Science*. 2014;36(1):94-99.