The Pharma Innovation Journal 2022; 11(9): 1400-1403

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(9): 1400-1403

www.thepharmajournal.com
Received: 12-06-2022
Accepted: 14-07-2022

Rupendra Mewada
Department of Horticulture, Lovely Professional University, Punjab, India

Manish Bakshi
Department of Horticulture, Lovely Professional University, Punjab, India

Corresponding Author:
Rupendra Mewada
Department of Horticulture, Lovely Professional University, Punjab, India

Effect of different chemicals on germination and seedling growth in papaya cvs. red lady and red sun

Rupendra Mewada and Manish Bakshi

Abstract
The experiment was laid out in Completely Randomized Design (CRD) with three replications. Each replication consists of thirteen treatments and all treatments were randomized separately in each replication. The treatments consisting of different chemicals like KNO_3 @ 1 and 2g, Thiourea @ 1 and 2g and GA_3 @ 100 and 200 ppm were used for pre-soaking the seeds of papaya varieties Red lady and Red Sun. Result concluded that the different chemicals like KNO_3, thiourea and GA_3 used for pre-soaking the seeds of papaya significantly influenced the different parameters in papaya. It was recorded that the treatment T_5 (KNO_3 @ 2g + Red lady) was found the best treatment among all chemicals used for germination and seedling growth in papaya and it also gave the maximum germination and growth parameters, whereas the minimum germination and growth parameters were recorded in treatment $_1$ (Control).

Keywords: Papaya, pre-soaking, chemicals, germination, growth

Introduction
The papaya, or *Carica papaya* Linn., is a significant tropical fruit crop and is hailed as one of nature's wonder fruits. The papaya, a member of the Caricaceae family and a native of Tropical America, is India's most important crop. Typically, seeds are used to propagate papaya (Cheema and Dhani, 1990) [4]. Papaya is typically spread through seed, and the germination rate and speed of papaya seed are both relatively slow. Pre-treating papaya seeds with growth regulators and micronutrients before sowing them has an impact on the germination rate and seedling growth. Gibberellic acid has the ability to accelerate seed germination, trigger mitotic division in some plant leaves, and stimulate the growth of stems and roots quickly. The most crucial factors in a papaya nursery technique's effective sapling production are proper seed germination and seedling growth. Pre-treating papaya seeds with growth regulators and micronutrients before sowing them has an impact on the germination rate and seedling growth. Several fruit crops use a variety of pre-sowing seed treatments, including pesticides and plant growth regulators, to promote seed germination and seedling growth. Gibberellins have an impact on how seed stores are mobilised during germination. As a result, they are regarded as significant germination boosters that help seeds germinate more quickly and uniformly, which enhances the performance of papaya seeds (Zanotti and Barros, 2014) [20].
The germination time of seeds that were treated in GA_3 200 ppm and thiourea 200 ppm for 12 hours was reduced by around 50%. Chemical treatments such as GA_3, KNO_3, sodium thiosulphate, and thiourea play in relation to breaking dormancy, seed germination, growth, and development of plants (Anburani and Shakila, 2010; Kadam *et al*.; 2010) [1, 6]. Keeping in view the potential role of these chemicals in enhancing the germination, an experiment was conducted to evaluate the effect of various chemicals on germination and successive growth of papaya cv. Red Lady and Red Sun.

Material and Methods
The present investigation entitled “Effect of different chemicals on germination and seedling growth in papaya cvs. Red Lady and Red Sun” was carried out at Lovely Professional University, School of Agriculture near experimental farm in Hi-tech Polyhouse and Shade Net House, Phagwara, Punjab. The experiment was laid out in Completely Randomized Design (CRD) with three replications. Each replication consists of thirteen treatments (T_1 – Control, T_2 - GA_3 @ 100 PPM + Red lady, T_3 - GA_3 @ 200 PPM + Red lady, T_4 - KNO_3 @ 1g + Red lady, T_5 - KNO_3 @ 2g + Red lady, T_6 - Thiourea @ 1g + Red lady, T_7 - Thiourea @ 2g + Red

lady, T_8 - GA_3 @ 100 PPM + Red sun, T_9 - GA_3 @ 200 PPM + Red sun, T_{10} - KNO_3 @ 1g + Red sun, T_{11} - KNO_3 @ 2g + Red sun, T_{12} - Thiourea @ 1g + Red sun and T_{13} - Thiourea @ 2g + Red sun) were used for pre-soaking the seeds of papaya varieties Red lady and Red Sun. The seeds were treated with different chemicals as per the treatment specifications. Germination parameters, growth parameters and rooting parameters were recorded on plants using standard procedures. The data was analyzed using OPSTAT software and significance of treatments was tested at 5 per cent level of significance.

Result and Discussion

Germination percentage

The results showed that the various chemicals used to pre-soak papaya seeds, such as KNO_3, thiourea, and GA_3, had a substantial impact on the germination percentage of papaya seeds. The treatment T_5 (KNO_3 @ 2g + Red Lady) produced the highest germination percentage, and it was discovered to be the most effective method for influencing papaya seed germination. However, treatment T_1 showed the lowest percentage of germination (Control). This could be as a result of the crucial roles that KNO_3, thiourea, and GA_3 play in the early enzyme induction stage and the activation of the reserve food mobilisation system, both of which contribute to the improvement of germination. Similar results for most of the characters were also reported by Padma *et al.* (2013) [11], Mandal *et al.* (2015) [8], Thiruppathi and Mullaimaran (2020) [18] and Yeddula *et al.* (2022) [19].

Germination duration

Results showed that treatment T_5 (KNO_3 @ 2g + Red Lady) was the best treatment out of all the treatments and that it required the fewest days to complete germination, while treatment T_1 required the most days to complete germination (Control). GA_3, KNO_3, and thiourea all considerably aid in the leaching out of the inhibitors, which in turn helps to break the seed dormancy. The ability of various compounds to deactivate particular inhibitors present in the seed may be the reason why seed treatment with different chemicals increases germination percentage. These results are supported by the findings of Saraswat *et al.* (2013) [16], Desai *et al.* (2017) [5] and Maneesha and Priya (2019) [9].

Days required for the first appearance of plumule

The outcome clearly demonstrates that treatment T_5 (KNO_3 @ 2g + Red Lady) was determined to be the best treatment when compared to all other treatments, whereas treatment T_1 (Control) was shown to have the most number of days needed for the first appearance of plumule. Findings are in agreement with those of Patil *et al.* (2012) [13], Saraswat *et al.* (2013) [16] and Ramteke *et al.* (2015a) [15].

Height of the plant after 30 and 60 DAS (cm)

The maximum height of the plant after 30 and 60 DAS was recorded under treatment T_5 (KNO_3 @ 2g + Red lady) and it was found the best treatment for influenced the germination of papaya seeds. However, the minimum height of the plant after 30 and 60 DAS was observed in treatment T_1 (Control). It may be because several compounds, such as KNO3, thiourea, and GA3, boost the osmotic uptake of nutrients, which leads to cell elongation and increases internodal length, which ultimately leads to an increase in plant height. These results are supported by the findings of Anjanawe *et al.* (2012) [3], Thiruppathi and Mullaimaran (2020) [18] and Yeddula *et al.* (2022) [19].

Leaves per plant after 30 and 60 DAS

The treatment T_5 (KNO_3 @ 2g + Red Lady) was shown to be the best one for influencing the germination of papaya seeds, as it produced the most leaves per plant after 30 and 60 DAS. However, treatment T_1 had the fewest leaves per plant at 30 and 60 DAS (Control). This could be as a result of the osmotic uptake of nutrients being boosted by various chemicals like KNO_3, thiourea, and GA_3, which led to cell elongation and increased intermodal length, which ultimately produced more leaves per seedling. The results are in confirmation with the results achieved by Supe *et al.* (2012) [17], Nagar *et al.* (2016) [10] and Parab *et al.* (2017) [12].

Chlorophyll content (mg/100g)

It is recorded that the treatment T_5 (KNO_3 @ 2g + Red lady) was found the best treatment among all the treatments and it gave the maximum chlorophyll content and the minimum chlorophyll content was noted in treatment T_1 (Control). It might be due the application of different chemicals like KNO_3, thiourea and GA_3 of seed treatment increased the number of leaves which results the higher chlorophyll content in papaya leaves. Findings are in agreement with those of Saraswat *et al.* (2013) [16], Kumawat *et al.* (2014) [7] and Maneesha and Priya (2019) [9].

Mortality (%)

Result revealed that the treatment T_5 (KNO_3 @ 2g + Red lady) was found the best treatment for influencing different parameters of papaya and it gave the minimum mortality, whereas the maximum mortality was observed in treatment T_1 (Control). Due to the seed treatment with different chemicals were increased the germination and reduce the mortality of papaya seedlings. These results are supported by the findings of Saraswat *et al.* (2013) [16], Ramteke *et al.* (2015b) [14], and Maneesha and Priya (2019) [9].

Fresh weight of stem (g)

According to a review of the data, treatment T_5 (KNO_3 @ 2g + Red Lady) produced the highest fresh weight of stem, and it was determined to be the best treatment for influencing fresh weight of papaya stem. However, treatment T_1 showed the lowest fresh weight of stem (Control). The rapid growth of the seedling with an increase in plant height, number of leaves, leaf area, and stem diameter, which in turn resulted in the maximum fresh weight of the stem, may be the cause of the maximum fresh weight with different chemicals like KNO_3, thiourea, and GA_3 seed treatment. Thiruppathi and Mullaimaran (2020) [18], Nagar *et al.* (2016) [10], and Anjanawe *et al.* (2013) [2] all reported similar findings for the majority of the characters.

Fresh weight of leaves (g)

The result revealed that the different chemicals like KNO_3, thiourea and GA_3 used for pre-soaking the seeds of papaya were significantly influenced the fresh weight of leaves in papaya. The maximum fresh weight of leaves was observed under treatment T_5 (KNO_3 @ 2g + Red lady) and it was found the best treatment for influenced the germination of papaya seeds. However, the minimum fresh weight of leaves was

found in treatment T_1 (Control). Similar results for most of the characters were also reported by Nagar *et al.* (2016) [10] and Parab *et al.* (2017) [12].

Fresh weight of roots (g)

It was obtained that the different chemicals like KNO_3, thiourea and GA_3 used for pre-soaking the seeds of papaya were significantly influenced the fresh weight of papaya roots. The maximum fresh weight of roots was observed under treatment T_5 (KNO_3 @ 2g + Red lady) and it was found the best treatment for influenced the fresh weight of papaya roots. However, the minimum fresh weight of roots was observed in treatment T_1 (Control). This might be due to the use of different seed treatment chemicals were influenced the plant growth and also root development in papaya and improve the fresh weight of roots. Findings are in agreement with those of Anjanawe *et al.* (2012) [3] and Thiruppathi and Mullaimaran (2020) [18].

Primary and lateral roots/plant

Result revealed that the different chemicals like KNO_3, thiourea and GA_3 used for pre-soaking the seeds of papaya were significantly influenced the roots in papaya seedlings and it was observed that there was only single primary root was found in papaya plants. Whereas, the maximum lateral roots/plant was recorded under treatment T_5 (KNO_3 @ 2g + Red lady) and it was found the best treatment for influenced the lateral roots in papaya plant. However, the minimum lateral roots/plant was recorded in treatment T_1 (Control). These results are supported by the findings of Kumawat *et al.* (2014) [7], Ramteke *et al.* (2015b) [14], Maneesha and Priya (2019) [9] and Yeddula *et al.* (2022) [19].

Table 1: Effect of different chemicals on germination and seedling growth in papaya

Treatment symbols	Treatment detail	Germination percentage	Days required for the completion of germination	Days required for the first appearance of plumule	Height of the plant (cm)		Leaves per plant (cm)	
					30 DAS	60 DAS	30 DAS	60 DAS
T_1	Control	62.12	13.06	9.52	17.07	42.06	5.42	6.90
T_2	GA_3 @ 100 PPM + Red lady	67.75	12.11	9.13	19.12	46.56	6.28	7.75
T_3	GA_3 @ 200 PPM + Red lady	81.18	10.05	8.34	25.17	53.02	7.19	9.13
T_4	KNO_3 @ 1g + Red lady	71.60	11.64	8.76	20.78	49.46	6.52	8.29
T_5	KNO_3 @ 2g + Red lady	85.00	9.02	8.02	27.04	55.19	7.40	9.44
T_6	Thiourea @ 1g + Red lady	64.46	12.56	9.35	18.10	44.25	5.86	7.26
T_7	Thiourea @ 2g + Red lady	76.23	10.76	8.55	22.22	51.56	6.85	8.80
T_8	GA_3 @ 100 PPM + Red sun	65.56	12.32	9.34	18.43	45.89	6.00	7.42
T_9	GA_3 @ 200 PPM + Red sun	79.19	10.43	8.46	23.32	52.41	7.04	9.04
T_{10}	KNO_3 @ 1g + Red sun	68.54	11.85	8.92	19.81	47.66	6.35	7.93
T_{11}	KNO_3 @ 2g + Red sun	83.46	9.53	8.25	26.79	54.27	7.34	9.28
T_{12}	Thiourea @ 1g + Red sun	63.41	12.86	9.44	17.86	43.03	5.70	7.04
T_{13}	Thiourea @ 2g + Red sun	73.45	11.09	8.60	21.82	50.35	6.75	8.58
	SEm ±	**0.865**	**0.079**	**0.062**	**0.613**	**0.932**	**0.050**	**0.049**
	CD 5%	**2.665**	**0.244**	**0.190**	**1.889**	**2.873**	**0.155**	**0.150**

Table 2: Effect of different chemicals on germination and seedling growth in papaya

Treatment symbols	Treatment detail	Chlorophyll content (mg/100g)	Mortality (%)	Fresh weight of stem (g)	Fresh weight of leaves (g)	Fresh weight of roots (g)	Primary roots/ plant	Lateral roots/ plant
T_1	Control	6.10	11.72	6.90	3.41	0.90	1.00	8.00
T_2	GA_3 @ 100 PPM + Red lady	6.26	9.34	7.09	4.76	1.07	1.00	9.46
T_3	GA_3 @ 200 PPM + Red lady	6.77	7.01	7.25	6.71	1.27	1.00	12.02
T_4	KNO_3 @ 1g + Red lady	6.48	8.67	7.16	5.49	1.18	1.00	9.98
T_5	KNO_3 @ 2g + Red lady	6.90	6.40	7.32	7.40	1.30	1.00	13.02
T_6	Thiourea @ 1g + Red lady	6.18	10.18	6.98	4.10	1.00	1.00	8.76
T_7	Thiourea @ 2g +	6.57	7.97	7.21	6.10	1.22	1.00	10.99

	Red lady							
T_8	GA_3 @ 100 PPM + Red sun	6.23	9.75	7.05	4.43	1.03	1.00	9.10
T_9	GA_3 @ 200 PPM + Red sun	6.66	7.51	7.24	6.44	1.24	1.00	11.42
T_{10}	KNO_3 @ 1g + Red sun	6.34	9.13	7.12	5.07	1.15	1.00	9.77
T_{11}	KNO_3 @ 2g + Red sun	6.82	6.82	7.27	7.19	1.29	1.00	12.63
T_{12}	Thiourea @ 1g + Red sun	6.15	10.85	6.95	3.85	0.96	1.00	8.35
T_{13}	Thiourea @ 2g + Red sun	6.52	8.31	7.17	5.74	1.21	1.00	10.61
	SEm ±	**0.035**	**0.080**	**0.031**	**0.071**	**0.021**	**-**	**0.101**
	CD 5%	**0.108**	**0.247**	**0.095**	**0.218**	**0.063**	**-**	**0.312**

Conclusion

Result revealed that the different chemicals like KNO_3, thiourea and GA_3 used for pre-soaking the seeds of papaya were significantly influenced the different parameters in papaya. It was recorded that the treatment T_5 (KNO_3 @ 2g + Red lady) was found the best treatment among all chemicals used for germination and seedling growth in papaya and it also gave the maximum germination and growth parameters, whereas the minimum germination and growth parameters were recorded in treatment $_1$ (Control).

References

1. Anburani A, Shakila A. Influence of seed treatment on the enhancement of germination and seedling vigour of papaya. Acta Horticulture. 2010;851:295-298.
2. 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.
3. 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. 2012;15(1):31-34.
4. Cheema GS, Dhani PG. In. Fruits-Tropical and Subtropical. (Eds. Bose, T.K., Mitra, S.K. and Sanyal, D.), Naya Prakash. 1990;1:507.
5. Desai A, Trivedi A, Panchal B, Desai V. Improvement of papaya seed germination by different growth regulator and growing media under net house condition. Int. J. Curr. Microbio. App-Sci. 2017;6(9).
6. Kadam AB, Singh DB, Kade RA. Effect of plant growth regulators and potassium nitrate on growth of seedling of Kagzi lime. The Asian Journal of Horticulture. 2010;5(2):431-434.
7. Kumawat R, Maji S, Meena DC. Studies on seed germination and seedling growth of papaya (*Carica papaya* L.) cv. Coorg Honey Dew as influenced by media and chemicals. Journal of Crop and Weed. 2014;10(2):281-286.
8. Mandal B, Dash AK, Mishra N, Mishra PP, Ray M. Studies on the effect of media and growth regulating substances on seed germination of papaya. International Journal of Tropical Agriculture. 2015;33(4):2621-2623.
9. Maneesha SR, Priya DS. Effect of Calcium Nitrate and Potassium Nitrate Priming on Seed Germination and Seedling Vigour of Papaya (*Carica papaya* L.). Journal of Horticultural Sciences. 2019;14(2):149-154.
10. Nagar SK, Vihol NJ, Arvind RK. Effect of different growing media on germination and establishment of seedlings of papaya (*Carica papaya* L.) cv. Madhubindu under net house conditions. International Journal of Life Sciences. 2016;11(3):1465-1468.
11. Padma lav, Basvaraju GV, Sarika G, Amrutha N. Effect of seed treatments to enhance seed quality of papaya (*Carica papaya*) Cv. Surya. Globa journal of biology, Agriculture and health Sciences. 2013;2(3):221-225.
12. Parab AM, Mathad JC, Malshe KV. Effect of Presoaking Chemicals on Germination and Subsequent Seedling Growth of Papaya (*Carica papaya*) Cv. Solo. IJCS. 2017;5(4):1812-1816.
13. Patil SR, Somkamble AM, Waskar DP. Effect of growth regulators and chemicals on germination and seedling growth of Rangpur lime under laboratory conditions. International Journal of Agricultural Sciences. 2012;8:494-497.
14. Ramteke V, Paithankar DH, Kamatyanatti M, Baghel MM, Chauhan J, Khichi P. Seed germination and seedling growth of papaya as influenced by GA_3 and potting media. Journal of progressive Agriculture. 2015b;6(1):129-133.
15. Ramteke V, Paithankar DH, Ningot EP, Kurrey VK. Effect of GA_3 and propagation media on germination, growth and vigour of papaya cv. Coorg Honey Dew. International Journal of Life Science. 2015a;10(3):1011-1016.
16. Saraswat N, Mishra S, Prasad VM. Effect of gibberellic acid and thiourea on seed germination, growth and survival of papaya (*Carica papaya* L.) cv. Pusa Nanha and Pusa Delicious. New Agriculturist. 2013;24(2):209-212.
17. Supe VS, Dhanshree P, Anju A, Bhagat, Rashmi S. Seed germination and seedling growth in aonla (*Emblica officinalis*). Bioinfolet. 2012;9(2):206-208.
18. Thiruppathi M, Mullaimaran S. Effect of seed treatments on germination, growth and vigour of papaya (*Carica papaya* L.) cv. red lady. International Journal of Chemical Studies. 2020;8(4):3528-3531.
19. Yeddula N, Topno SE, Srivastava V, Bahadur V, Prasad VM, Singh SK. Effect of chemical priming on seed germination and seedling growth in papaya (*Carica papaya* L.). The Pharma Innovation Journal. 2022;11(5):2542-2546.
20. Zanotti RF, Dias DCFDS, Barros RS, Silva LJD, Sekita MC. Germination of Solo papaya seeds treated with plant hormones. Journal of Seed Science. 2014;36(1):94-99.