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RESEARCH ARTICLE

EFFECT OF PLANT GROWTH REGULATORS AND CHEMICALS ON SEED GERMINATION AND SEEDLING GROWTH IN PAPAYA (CARICA PAPAYA) VAR. RED LADY

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ABSTRACT

Seed germination is the most important aspect for raising the nursery for successful seedling production of Papaya. The present study was carried out at Department of Horticulture, Faculty of Agriculture, Annamalai University to study the Effect of Plant growth regulators and chemicals on seed germination and seedling growth in Papaya (*Carica Papaya*) variety Red lady. The treatments comprised of five levels of GA3 T_1 GA_3 100 ppm for 12 hrs, T_2 GA_3 200 ppm for 12 hrs , T_3 GA_3 300 ppm for 12 hrs , T_4 GA_3 400 ppm for 12 hrs, T_5 GA_3 500 ppm for 12 hrs and five levels of KNO3 T_6 KNO_3 0.5% for 12 hrs, T_7 KNO_3 1% for 12 hrs, T_8 KNO_3 1.5% for 12 hrs, T_9 KNO_3 2% for 12 hrs, T_{10} KNO_3 2.5% for 12 hrs and T_{11} Control (Without Soaking). Observations were recorded for germination percentage (%), Plant height (cm), No. of leaves, Leaf area (cm2), No. of primary roots, No. of lateral roots, Root length (cm), Fresh weight of seedling (g) and Dry weight of seedling (g). Results revealed that Treatment T_2 GA_3 200 ppm dipping for 12 hrs recorded the maximum germination percentage of papaya seeds (88.28 %) followed by T_3 GA_3 300 ppm for 12 hrs (83.56 %) than T11 control which recorded the minimum germination percentage of 41.08 %, plant height (25.84 cm), more number of leaves (19.58), maximum leaf area (49.36 cm2), more number of primary and lateral roots (13.04 and 93.31) with maximum root length (33.43 cm) and also recorded the maximum fresh weight and dry weight of seedlings (18.88 and 1.94 g) which was followed by the treatment T_3 GA_3 300 ppm for 12 hrs than control T11 which recorded the least values on all growth attributes.

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INTRODUCTION

The 7th important fruit crop of the country after Mango, Citrus, Banana, Apple, Guava and Sapota is Papaya. It is extensively grown in various states of India, mainly in Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, West Bengal, Chhattisgarh, Tamil Nadu, Assam, and Kerala. Seed germination in Papaya is erratic, very slow and also incomplete due to the presence of some inhibitors like phenolic compound. The cost of Papaya seed is also high so increasing germination percentage and producing more vigour seedling is a challenge of Papaya grower. To overcome this problem, Seed treatment is required to promote seed germination and to reduce the germination time with several chemicals and growth regulators. Gibberellic acid (GA3) can be used for seed treatment as it stimulates rapid stem and root growth, induce mitotic division in the leaves of some plants, and increase seed germination rate wheras KNO3 also induces fast germination of seeds.

Hence, this study was carried out with the objective to enhance the seed germination and seedling growth of papaya using GA3 and KNO3.

MATERIALS AND METHODS

The present study on Effect of of Plant growth regulators and chemicals on seed germination and seedling growth in Papaya (*Carica Papaya*) variety Red lady was carried out at Department of Horticulture, Faculty of Agriculture, Annamalai University during November - December 2021. The experiment was laid out in a Completely Randomized Design (CRD) with eleven treatments and three replications. Fully mature and healthy fruits of papaya were collected. Seeds were extracted and shade drying till the seed were completely dried. These fresh seed were collected and subjected to different presowing treatments.

Table 1. Effect of Plant growth regulators and chemicals on seed germination and seedling growth in Papaya (*Carica Papaya*)

Treatment Details	Germination Percentage (%)	Plant Height (cm)	No. of. Leaves Plant	Leaf area (cm^2)	No. of. primary Roots	No. of. Lateral Roots	Root length(cm)	Fresh Wt. of Seedling(gm)	Dry Wt. of seedling (gm)
T_1 GA_3 100 ppm	59.96	16.42	15.14	37.84	8.30	75.25	21.85	15.46	1.40
T_2 GA_3 200 ppm	88.28	27.64	20.58	49.36	13.04	93.31	33.43	18.88	1.94
T_3 GA_3 300 ppm	83.56	24.27	18.84	47.44	12.25	90.3	31.50	18.31	1.85
T_4 GA_3 400 ppm	69.40	19.56	16.62	41.68	9.88	81.27	25.71	16.60	1.58
T_5 GA_3 500 ppm	64.68	17.99	15.88	39.76	9.09	78.26	23.78	16.03	1.49
T_6 KNO_3 0.5%	78.84	22.70	18.10	45.52	11.46	87.29	29.57	17.74	1.76
T_7 KNO_3 1%	74.12	21.13	17.36	43.60	10.67	84.28	27.64	17.17	1.67
T_8 KNO_3 1.5%	55.24	14.85	14.40	35.92	7.51	72.25	19.92	14.89	1.31
T_9 KNO_3 2%	50.52	13.28	13.66	34.00	6.72	69.23	17.99	14.32	1.22
T_{10} KNO_3 2.5%	45.80	11.71	12.92	32.08	5.93	66.22	16.06	13.75	1.13
T_{11}	41.08	10.14	12.18	30.16	5.14	63.21	14.13	13.18	1.04
CD @5	2.72	1.23	0.34	1.52	0.49	1.01	1.43	0.27	0.03

The treatments comprised of five levels of GA3 T_1 GA_3 100 ppm for 12 hrs, T_2 GA_3 200 ppm for 12 hrs , T_3 GA_3 300 ppm for 12 hrs , T_4 GA_3 400 ppm for 12 hrs, T_5 GA_3 500 ppm for 12 hrs and five levels of KNO3 T_6 KNO_3 0.5% for 12 hrs, T_7 KNO_3 1% for 12 hrs, T_8 KNO_3 1.5% for 12 hrs, T_9 KNO_3 2% for 12 hrs, T_{10} KNO_3 2.5% for 12 hrs and T_{11} Control (Without Soaking). Observations were recorded for germination percentage (%), Plant height (cm), No. of leaves, Leaf area (cm2), No. of primary roots, No. of lateral roots, Root length (cm), Fresh weight of seedling (g) and Dry weight of seedling (g). The recorded data were analyzed statistically using various techniques as described by Panse and Sukhatme (1985). The treatment means were compared with C.D. at 5 per cent level.

RESULTS AND DISCUSSION

As per the results, the significant different was observed between the treatment on seed germination and seedling growth attributes.

Effect of growth regulators on seed germination: Treatment T_2 GA_3 200 ppm dipping for 12 hrs recorded the maximum germination percentage of papaya seeds (88.28 %) followed by T_3 GA_3 300 ppm for 12 hrs (83.56 %) than T11 control which recorded the minimum germination percentage of 41.08 %. Similar trends were also obtained by Deb *et al*., (2010). It might be due to GA3 helped in physically breaching, thereby removing physiological barriers associated with the impermeable seed coats that cause seed dormancy (Ramteke *et al.,* 2015). Gibberellic acid acts on the embryo and causes synthesis of hydrolyzing enzymes particularly growth of embryo and this hydrolyzed food is utilized for growth of embryo and there by enhanced the germination (Babu *et al.,* 2010).

Effect of growth regulators on seedling growth attributes: Treatment T_2 GA_3 200 ppm dipping for 12 hrs was recorded significantly the maximum plant height (27.64 cm), more number of leaves (20.58), maximum leaf area (49.36 cm2), more number of primary and lateral roots (13.04 and 93.31) with maximum root length (33.43 cm) and also recorded the maximum fresh weight and dry weight of seedlings (18.88 and 1.94 g) which was followed by the treatment T_3 GA_3 300 ppm for 12 hrs than control T11 which recorded the least values on all growth attributes. This might be due to the fact that, GA_3 increases somatic uptake of nutrients, causing cell elongation and thus increasing the length of tap root and number of secondary roots.

Increase in number of leaves might be due to the reason that GA_3 helps in invigoration of physiological process of plant and stimulatory effect of chemicals to form new leaves at a faster rate. The results are in conformity of Kumawat et *al.,* (2014) in papaya seeds and Narendhiran *et al*., (2024) recorded that application of plant growth regulators enhances the seedling growth in coriander.

CONCLUSION

On the basis of the results obtained in this study, it is concluded that the growth regulators and growth media significantly influence the seed germination and seedling growth. Seed treatment with GA_3 200 ppm for 12 hrs enhance the germination and seedling growth in papaya.

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