

Effect of Plant Growth Regulators on Seed Germination and Seedling Vigour in Jack (*Artocarpus heterophyllus*)

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India is considered to be the native home of jack. It is mainly distributed in the tropical humid belt. In India, Assam, Bihar, Kerala and Tamil Nadu are the main jack growing states. In Tamil Nadu lower Palani hills of Dindigul District and Panruti of Cuddalore districts are known for the best quality jack fruits. The fleshy carpel is the edible portion. Hundred-gram edible portion contains 19.8 g carbohydrate mainly as sugars, 1.9g protein, 0.1g fat, 1.1g fibre, 20 mg calcium, 41 mg Phosphorous 0.566 mg iron, 175 µg carotene (Vitamin A), 0.03 mg thiamine, 0.13 mg riboflavin, 0.4 mg niacin and 7 mg vitamin C. One grams of jack carpels supply 88 kcal of energy [1]. Recently it has been reported that jack fruit could be very useful in the treatment of the dreaded disease of human being- AIDS. An extract of jack fruit was seen to have inhibited the growth of HIV infection in vitro. The power of this substance called jacaline was discovered by Jean Favero, Department of Microbiology and Antibacterial immunology, Montpellier University, France. It's used as a table fruit, making pickles, for dehydration into jack leather or thin round Papad. Canned jack fruit, syrup, jam, jelly and candy [2]. Preservation of ripe flakes in bottles after mixing with sugar and honey is very common in west coast. The outer pericarp of the fruit and sterile flowers (Present in between the fleshy fertile flakes) is praised as cattle feed. From seeds, a starchy flour is made. The seeds are boiled or roasted and eaten out of hand or after soaking in syrups for some time. The seeds are popular ingredients in many culinary preparations [3].

Growth regulators commonly employed for rooting, vegetative propagation and overall yield of several plants [4]. Growth regulators are mostly used for improving the productivity of a large number of agricultural crops, and seed germination [5]. The jackfruit seeds lost viability very rapidly, even if it delayed one or two weeks in planting will lead to poor germination [6]. Jackfruit seeds are consider being recalcitrant, and cannot survive more than few days or weeks in storage at ambient temperature [7]. Realizing the

importance of quick germination of jackfruit seeds and subsequent growth of seedlings the pre-soaking chemicals had beneficial effect on seed germination and growth of jack seedling have been taken under the present experiment.

The experiment was conducted at Department of Horticulture, Faculty of Agriculture. The experiment was laid out in completely randomized block design with nine treatments viz., GA₃ @ (25, 50, 75 and 100 ppm for 24 hours) and NAA @ (25, 50, 75, and 100 ppm for 24 hours) and control (Untreated) which were replicated thrice times.

The results showed that pre-soaking chemicals had beneficial effect on seed germination and growth of jack seedling.

Seed germination parameters

The seed germination parameters of jack as affected by pre-soaking chemicals are presented in (Table 1). The highest germination (89.34%) was recorded in GA₃ @ 75 ppm as compared to control (36.06%). This might be due to nitrogen compounds which affect germination through the detection of nitrogen in the soil. These could stimulate the pentose phosphate pathway in seeds and thereby increasing seed germination by increasing the oxidation of NADPH to NADH. Similar results were obtained by [8] where they have reported highest germination in papaya seeds treated with potassium salts because of increased in water uptake needed by germinating seed. Similar findings were made by [9] and [10] in papaya.

Growth parameters

The growth parameters of jack as affected by pre-soaking chemicals are presented in (Table 1). The plant height is one of the important characters in growth and development of seedling. Seeds treated with GA₃ @ 75 ppm recorded highest height (49.78 cm) as compared to control which had recorded the lowest (24.02 cm). From the physiological point of view, leaf is the most important photosynthetic site of the plant. It is the source from which the plant derives energy for its metabolic activities. The primary function of leaves is the carbon assimilation. Regarding the number of leaves, recorded highest in seeds treated with GA₃ @ 75 ppm (21.78) and least was recorded in control (12.02). Similar results were obtained by [11] for seeds of papaya treated with 200 ppm of GA₃. The favourable effect of gibberlic acid on plant growth might be

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due to improved photosynthetic efficiency. Regarding number of leaves, length and breadth recorded maximum GA₃ @ 75 ppm and minimum as control. The application of GA₃ might have boosted the leaf growth by increasing cell multiplication

and cell elongation resulting in better leaf area. Similar results of increased leaf area with GA₃ pre-sowing treatment were reported by [12]. Similar findings also reported by [13] and [14] in coriander.

Table 1 Effect of plant growth regulators on seed germination and seedling vigour in Jack (*Artocarpus heterophyllus*)

Treatment details	Germination (%)	Plant height (cm)	No. of leaves per seedling	Leaf length (cm)	Leaf breadth (cm)
T ₁ : GA ₃ @ 25 ppm for 24 hours	49.38	30.46	14.46	12.59	5.96
T ₂ : GA ₃ @ 50 ppm for 24 hours	82.68	46.56	20.56	13.74	6.56
T ₃ : GA ₃ @ 75 ppm for 24 hours	89.34	49.78	21.78	13.97	6.68
T ₄ : GA ₃ @ 100 ppm for 24 hours	76.02	43.34	19.34	13.51	6.44
T ₅ : NAA @ 25 ppm for 24 hours	56.04	33.68	15.68	12.82	6.08
T ₆ : NAA @ 50 ppm for 24 hours	69.36	40.12	18.12	13.28	6.32
T ₇ : NAA @ 75 ppm for 24 hours	42.72	27.24	13.24	12.36	5.84
T ₈ : NAA @ 100 ppm for 24 hours	62.7	36.9	16.9	13.05	6.2
T ₉ : Control	36.06	24.02	12.02	12.13	5.72
S. Ed.	2.33	1.21	0.51	0.06	0.03
CD @ 0.5%	4.66	2.42	1.02	0.13	0.07

Table 2 Effect of plant growth regulators on seed germination and seedling vigour in Jack (*Artocarpus heterophyllus*)

Treatment details	Stem girth (mm)	No. of roots seedlings	Root length (cm)
T ₁ : GA ₃ @ 25 ppm for 24 hours	1.43	13.69	15.92
T ₂ : GA ₃ @ 50 ppm for 24 hours	1.98	20.34	23.12
T ₃ : GA ₃ @ 75 ppm for 24 hours	2.09	21.67	24.56
T ₄ : GA ₃ @ 100 ppm for 24 hours	1.87	19.01	21.68
T ₅ : NAA @ 25 ppm for 24 hours	1.54	15.02	17.36
T ₆ : NAA @ 50 ppm for 24 hours	1.76	17.68	20.24
T ₇ : NAA @ 75 ppm for 24 hours	1.32	12.36	14.48
T ₈ : NAA @ 100 ppm for 24 hours	1.65	16.35	18.8
T ₉ : Control	1.21	11.03	13.04
S. Ed.	0.03	0.16	0.57
CD @ 0.5%	0.06	0.33	1.14

Data indicated in (Table 2) presented stem girth maximum 2.09(mm) (T₃) GA₃ @ 75ppm and minimum 1.21 (mm) as control. The maximum stem girth in case of seedlings obtained from GA₃ presoaked seeds might be due to the fact that GA₃ application enhanced the rate of cell division and elongation of stem portion. Increase in stem girth may be possible due to stimulation of cambium and its immediate cell progeny as observed by [15] in aonla. Regarding to length of root, seeds treated with GA₃ at 75 ppm recorded the highest (24.56 cm) root length as compared to control (13.04 cm). The maximum root length might be due to elongation of the cells in the sub-apical region of roots as reported by [16]. This is in close agreement with [17]. The number of roots per plant, GA₃ @ 75 ppm treated seeds recorded the highest (21.67) and minimum (11.03) as control. This might be because of higher mobilization of water, nutrient uptake capacity and its transportation by gibberellin than cytokinin which has resulted

into more production of photosynthetic products and translocation into various parts of the plant. The result is in conformity with the findings of [18] and [19] in papaya. Similarly, because of the more accumulation of photosynthetic products dry weight of shoot, dry weight of root and total seedling dry weight was recorded maximum in GA₃ at 200 ppm. Similar results were obtained by [20] in tamarind.

SUMMARY

The present investigation was conducted at Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar to study the effect of plant growth regulators on seed germination and seedling vigour in jack. The experiment was laid out in completely randomized block design comprising two types of growth regulators like GA₃ and NAA concentrations (25, 50, 75 and 100 ppm). The

results revealed that jack fruit seeds treated with GA₃ @ 75 ppm for 24 hours recorded maximum germination percentage (89.34%), plant height (49.78 cm), number of leaves / seedling (21.78), leaf length (13.97 cm), leaf breadth (6.68), Stem girth (2.09 mm), number of roots / seedlings (21.67), root length (24.56 cm).

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