

**To study the impact of seed storage period and growth regulators on physiological parameters of Jackfruit (*Artocarpus heterophyllus* Lam.) seedling**

**ABSTRACT**

An experiment entitled “To study the impact of seed storage period and growth regulators on physiological parameters of Jackfruit (*Artocarpus heterophyllus* Lam.) seedling” was conducted in a green shade net house at Horticultural Research Farm, Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand during the year kharif-2019. The treatment comprised three levels of seed storage period (S) viz., S<sub>1</sub>- 0 days after extraction of seed, S<sub>2</sub>- 5 days after extraction of seed and S<sub>3</sub>- 10 days after extraction of seed and five seed soaking treatments of growth regulators GA<sub>3</sub> for 24 hrs (G) viz., G<sub>1</sub>- GA<sub>3</sub> ‘at’ 100 mg l<sup>-1</sup>, G<sub>2</sub>- GA<sub>3</sub> ‘at’ 150 mg l<sup>-1</sup>, G<sub>3</sub>- NAA ‘at’ 25 mg l<sup>-1</sup>, G<sub>4</sub>- NAA ‘at’ 50 mg l<sup>-1</sup> and G<sub>5</sub>- Control. The experiment was conducted in Completely Randomized Design (Factorial) with 15 treatment combinations and repeated thrice. Sowing of fresh extracted seeds of jackfruit recorded at 90 DAS maximum leaf area (43.38 cm<sup>2</sup>), root: shoot ratio (0.22), vigour index-I (41.60) and vigour index-II (3.17). While, Soaking seed in GA<sub>3</sub> ‘at’ 100 mg l<sup>-1</sup> for 24 hrs recorded at 90 DAS maximum leaf area (52.34 cm<sup>2</sup>), root: shoot ratio (0.22), vigour index-I (38.08) and vigour index-II (3.13). Treatment combination sowing of fresh extracted seeds and soaking seeds in GA<sub>3</sub> ‘at’ 100 mg l<sup>-1</sup> for 24 hrs recorded at 90 DAS maximum leaf area (59.87 cm<sup>2</sup>) vigour index-I (56.03) and vigour index-II (5.37).

**Keywords:** Jackfruit, Seed storage period, Growth regulators, Leaf area, Vigour Index

**INTRODUCTION**

“The Jackfruit (*Artocarpus heterophyllus* Lam.) is a member of the Moraceae family. It is the largest edible fruit in the world reported by Naik,1949 and Sturrock, 1959. The word *Artocarpus* is derived from the Greek words artos (bread) and carpos (fruit) as reported by Bailey, 1949. It is a native species of the Western Ghats of India and Malaysia. Bangladesh, India, Myanmar, Indonesia, Sri Lanka and Malaysia are major jackfruit producers. The area under jackfruit cultivation is 185 thousand hectares with production of 1830 thousand MT with productivity of 9.89 MT per hectare” (Anon., 2018). “The fruits may have 10-500 flakes and seeds. Seeds make up around 10 to 15 % of the total fruit weight and have high carbohydrate and protein content” (Bobbio *et al.*, 1978, Kumar *et al.*, 1988). “Jackfruit seeds rapidly lose their viability. Poor germination will result from even a one-or-two-week delay in seedlings. Jackfruit

seeds are recalcitrant in nature. Recalcitrant seeds are relatively high in moisture content and possess a characteristic feature of losing their viability during desiccation. The recalcitrant seeds impose serious storage problems due to their desiccation and chilling sensitivity” (Chin and Roberts, 1980). “Storage above a critical level of time leads to loss of viability. Recalcitrant seeds are intolerant to drying and long-term storage conditions. Hence, prolonging the viability of seeds would facilitate the availability of seeds for various plantation programmes and also for use by nurserymen and local farmers throughout the year”. [18] Realizing the importance of raising jackfruit seedlings for quick germination of seeds and subsequent growth of seedlings the pre-soaking treatment of seeds with growth regulators was performed in the present experiment.

### **Materials and Methods**

The experiment was conducted in the green shade net house (75 % shade) at the Horticulture Research Farm and Nursery, B. A. College of Agriculture, Anand Agricultural University, Anand during the month of July- October 2019. “The experiment was laid out in Completely Randomized Design with factorial concept having 15 treatment combinations, comprising of 3 level of seed storage *viz.*, S<sub>1</sub>- 0 days after extraction of seed, S<sub>2</sub>- 5 days after extraction of seed and S<sub>3</sub>- 10 days after extraction of seed with 5 levels of growth regulators (G) *viz.*, G<sub>1</sub>- GA<sub>3</sub> ‘at’ 100 mg l<sup>-1</sup>, G<sub>2</sub>- GA<sub>3</sub> ‘at’ 150 mg l<sup>-1</sup>, G<sub>3</sub>- NAA ‘at’ 25 mg l<sup>-1</sup>, G<sub>4</sub>- NAA ‘at’ 50 mg l<sup>-1</sup> and G<sub>5</sub>- Control. The treatment was repeated thrice. The treatment was repeated thrice. Fresh Jackfruits were collected from the local farmer field. Seeds were carefully extracted from fully ripened and healthy fruits of jackfruit. Healthy seeds were selected and soaked in different concentrations of growth regulators for 24 hours as per the treatments before sowing. Healthy seeds were stored in a cloth bag at ambient conditions. The seeds were stored in different lots for different sowing dates. After treatment seeds were sown in polythene bag size 7"× 5", previously filled with potting mixture which was prepared by mixing two parts of soil, one part of rotted FYM and one part of vermicompost (2:1:1). The polythene bags were placed in flat beds and proper space in green shade net. The bags were watered daily. The observation on the number of days taken for germination and germination percentage were recorded. Physiological parameters *viz.*, leaf area at 30, 60 and 90 DAS and root: shoot ratio, Vigour index-I and Vigour index-II at 90 DAS were recorded from 5 randomly selected plants and statically analysed”. [18]

### **Results and Discussion**

The seed storage period also observed a significant effect on physiological parameters *viz.*, leaf area, root: shoot ratio, vigour index-I and vigour index-II. At 30, 60 and 90 DAS, sowing of fresh

extracted seeds ( $S_1$  - 0 days after extraction of seed) recorded maximum leaf area (30.25, 39.16 and 43.38 cm<sup>2</sup>, respectively) and at 90 DAS, maximum root: shoot ratio (0.22), vigour index- I (41.60) and vigour index- II (3.17). This might be due to freshly extracted seeds having more vigour, high moisture and more nutrient reserve resulting in healthy and vigorous seedling. These results are in close agreement with the results of Prajapati *et al.* (2017) in Kagzi Lime and Deepika *et al.* (2014) in Karonda.

### **Effect of Growth Regulators**

Data presented in Table 1 showed that growth regulators observed a significant effect on physiological parameters *viz.* leaf area, root: shoot ratio, vigour index-I and vigour index-II. At 30, 60 and 90 DAS, soaking the seeds in GA<sub>3</sub> @ 100 mg l<sup>-1</sup> for 24 hrs recorded maximum leaf area (32.87, 42.22 and 52.34 cm<sup>2</sup>, respectively) and at 90 DAS, maximum root: shoot ratio (0.22), vigour index- I (38.08) and vigour index- II (3.13). It might be due to seed treatment with GA<sub>3</sub> increased cell division and cell elongation which ultimately increased the length and width of leaves. In terms of Jackfruit and Tamarind, Prajapati *et al.* 2014 and Patel *et al.* 2018 reported similar results. The GA<sub>3</sub>-treated seed showed the greatest vigour index II, which may be related to enzymatic and hormonal mechanisms that enhanced metabolic processes such as sugar mobilization, protein hydrolysis and oxidation, which increased seedling dry weight. Vasantha *et al.* 2014, Sharma 2016 and Bamaniya 2017 in Khirni, Parmar *et al.* 2016 in Custard Apple, Chiranjeevi *et al.* 2017 in Aonla and Padma *et al.* 2015 in Papaya all reported similar results.

### **Interaction Effect of Seed Storage Period and Growth Regulators**

It is evident from the data in Table 2 that the Interaction effect of the seed storage period and growth regulators showed a significant effect on physiological parameters except for the root: shoot ratio at 90 DAS. Treatment combination sowing of fresh extracted seeds with soaking in GA<sub>3</sub> 'at' 100 mg l<sup>-1</sup> for 24 hrs found maximum leaf area at 30, 60 and 90 DAS (36.97, 45.88 and 59.87 cm<sup>2</sup>, respectively) and at 90 DAS vigour index-I (56.03) and vigour index II (5.37). This might be due to the combined effect of fresh seeds and GA<sub>3</sub> which increased the germination percentage and length of seedling.

## **CONCLUSION**

In order to establish the formulations in the market on the basis of low risk/high benefit ratio as opposed to high risk/low benefit ratio in their current forms, more preclinical and clinical studies should be conducted in the near future. Demonstrations of direct delivery of RM into the brain in significant quantities might aid in future research.

#### **FUTURE SCOPE**

The findings of this research will be helpful for the farmer as jackfruit is recalcitrant in nature so prolonging the viability of seeds by soaking in GA<sub>3</sub> for quick germination of seeds and subsequent growth of seedlings would facilitate the availability of seeds for use by nurserymen and local farmers round the year.

#### **ACKNOWLEDGEMENTS**

The Authors are highly grateful to Dr. B. N. Satodiya, Associate Professor, College of Horticulture at A. A. U., Anand for providing basic facilities at the Horticultural Research Farm for the completion of the Master's research work.

**CONFLICT OF INTEREST:** None

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**Table 1: To study the impact of seed storage period and growth regulators on physiological parameters of Jackfruit seedling**

Treatments	Leaf area (cm <sup>2</sup> )			Root:shoot ratio	Vigour index-I	Vigour index-II
	30 DAS	60 DAS	90 DAS	90 DAS	90 DAS	90 DAS
<b>Seed storage period (S)</b>						
S <sub>1</sub> 0 day after extraction of seed	30.25	39.16	48.38	0.22	41.60	3.17
S <sub>2</sub> 5 days after extraction of seed	28.01	37.94	45.85	0.19	29.68	2.26
S <sub>3</sub> 10 days after extraction of seed	26.82	36.45	44.11	0.19	22.13	1.25
S.Em. ±	0.31	0.36	0.55	0.004	0.47	0.04
C.D. at 5 %	0.89	1.03	1.60	0.01	1.36	0.11
<b>Growth regulators (G)</b>						
G <sub>1</sub> GA <sub>3</sub> 'at' 100 mg l <sup>-1</sup>	32.87	42.22	52.34	0.22	38.08	3.13
G <sub>2</sub> GA <sub>3</sub> 'at' 150 mg l <sup>-1</sup>	27.56	38.56	47.24	0.20	27.74	1.92
G <sub>3</sub> NAA 'at' 25 mg l <sup>-1</sup>	25.64	35.96	41.33	0.20	34.18	1.63
G <sub>4</sub> NAA 'at' 50 mg l <sup>-1</sup>	31.92	40.96	50.70	0.21	34.89	2.92
G <sub>5</sub> Control	23.82	31.55	38.95	0.19	23.04	1.26
S.Em. ±	0.40	0.46	0.71	0.005	0.61	0.05
C.D. at 5%	1.15	1.33	2.06	0.01	1.76	0.14
S × G	Sig.	Sig.	Sig.	NS	Sig.	Sig.

C.V %	4.22	3.64	4.64	7.20	5.82	6.18
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**Table 2: Interaction effect of seed storage period and growth regulators on physiological parameters of Jackfruit seedling**

S	Leaf area (cm <sup>2</sup> )									Vigour index-I			Vigour index-II		
	30 DAS			60 DAS			90 DAS			90 DAS			90 DAS		
	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>
G <sub>1</sub>	36.9 7	31.7 0	29.9 3	45.8 8	41.4 1	39.3 6	59.8 7	50.2 7	46.9 0	56.0 3	34.3 7	26.4 5	5.3 7	3.0 0	1.5 5
G <sub>2</sub>	27.9 3	28.7 3	26.0 0	39.0 8	40.0 0	36.6 0	49.8 7	48.1 0	43.7 7	34.5 9	28.1 9	20.7 9	2.6 3	2.0 2	1.2 2
G <sub>3</sub>	25.5 0	25.1 7	26.2 7	35.9 2	36.8 8	35.0 7	38.9 7	42.3 6	42.6 7	40.3 8	30.7 8	22.2 8	2.5 8	1.6 4	0.8 9
G <sub>4</sub>	36.1 2	30.1 0	29.5 3	44.4 1	39.1 5	39.3 3	56.5 5	48.2 3	47.3 3	50.4 3	32.9 0	23.5 1	4.0 3	2.9 5	1.9 5
G <sub>5</sub>	24.7 3	24.3 7	22.3 5	30.5 3	32.2 4	31.8 7	36.6 7	40.3 0	39.8 8	29.0 7	22.6 4	18.0 0	1.7 5	1.3 6	0.7 5
S.Em. ±	0.69			0.79			1.24			1.05			0.08		
C.D. at 5 %	1.98			2.29			3.57			3.04			0.24		

