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Research paper

Effect of Seed Storage Period and Seed bed Covering Methods on Jackfruit (*Artocarpus heterophyllus* Lam.) Germination under River Nile State Conditions

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Abstract

The study was carried out at Hudeiba Research Station (HRS), River Nile state, Sudan during the period July – December of 2023. to evaluate jackfruit seed germination as affected by post extraction storage period and the best seed bed covering for proper seed germination. Best germination and growth results obtained from the shorter seed storage period without or with mango leave covering.

Keywords: *Jackfruit, germination, seed storage, seed bed covering*

تأثير فترة تخزين البذور وطرق تغطية مهد البذور على إنبات الجاك فروت(*Artocarpus heterophyllus* Lam.) تحت ظروف ولاية نهر النيل

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المستخلص

أجريت الدراسة في محطة أبحاث الحديبة بولاية نهر النيل بالسودان خلال الفترة من يوليو إلى ديسمبر 2023 لتقييم إنبات بذور الجاك فروت بعد فترات تخزين مختلفة ما بعد الاستخلاص وأفضل غطاء لمهد البذور يمكن من أنبات البذور بشكل صحيح .تم الحصول على أفضل نتائج الإنبات والنمو من فترة تخزين البذور الأقصر بدون أو مع تغطية أوراق المانجو

الكلمات المفتاحية: *الجاك فروت، الإنبات، تخزين البذور، تغطية مهد البذور*

Introduction

Jackfruit, *(Artocarpus heterophyllus*) belongs to family Moraceae. It is native to tropical Asia and widely grown throughout the wetland tropics for its huge edible fruits and robust wood. The unripe fruit is cooked as a vegetable. However, ripped fruit become brown in color and eaten fresh for the sweetly acid but insipid pulp surrounding the seeds. Seeds may be also cooked and eaten. Jackfruit is considered a staple food crop in Bangladesh and other areas in South and Southeast Asia. Canned or processed jackfruit has gained popularity as a meat substitute in some places **)**Petruzzello 2023). The tree reaches 15 to 20 meters tall at maturity. The leaves are large and stiff lustrous and green, 15 to 20 cm long. Flowers are small unisexual borne on compact inflorescences that emerge directly from the trunk and branches. The tree is from the largest fruit tree in the world and its fruit reach up to 60 cm long and weighing up to 18 kg. ellipsoidal and aggregate in shape, composed of multiple "bulbs" of seed-containing flesh around a gristly core, all of which is enclosed by a rough rind, which is green or yellow and spikey. The pulp inside the fruit smells and tastes in aroma between pineapple and bananas (Petruzzello 2023). Seeds are plenty and may reach up to 500 in the fruit. Each can reach an inch and a half in length. There are two main types of jackfruits. One is small and mushy. It tastes sweet, but it's slimy. The other type of jackfruit has crisp, crunchy flesh that's not as sweet as the small one. (Kathleen *et al.* 2021). The plant is considered promising to bridge the gap of food shortage and nutritional security. (Ojwang *et al*., 2022).

Information about jack fruit germination is meager and limited. Loss of seed viability in short storage period is encountered in Jack fruit. Jackfruit Seeds rapidly lose their viability due to seed desiccation or moisture loss. Poor germination will soon be a result from even a short period delay in pre planting seed storage. Jackfruit seeds are said to be recalcitrant in nature. Recalcitrant seeds are relatively containing high moisture content and possess a characteristic feature of losing their viability during desiccation (Chin and Roberts, 1980).

Gawankar and Haldavanekar, (2020) Studied the critical moisture loss percentage for viability of jackfruit seeds under ambient storage condition for 15, 30, 60, 90, 120 and 150 days revealed that maximum germination percentage (53.25 %) was recorded with minimum water loss (18.51 %) when jackfruit seeds stored at 15 days storage period.

The objective of this study is to evaluate jackfruit seed germination as affected by post extraction storage period and the best seed bed covering for proper seed germination.

Materials and methods

Nursery experiment was carried out at Hudeiba Research Station (HRS), River Nile state during the period July – December of 2023. Site coordinates are 17˚34' N and 23˚56' E with an altitude of 351 meter above sea level. The climate is described as hot climate with only a short (100-110 day) winter season. The experiment was laid in factorial experiment (RCBD) with three replicates,

covering methods as main factor (without covering, white plastic and mango leaves coverings) and time after extraction (storage period) as second factor (one week, four week and seven weeks after extraction). Seeds were planted in plastic bags 50X40 cm diameter and in 2.53 cm depth and irrigated 2 time weekly. Soil mix was river loam and sand 2 to 1, Thirty-six seed were planted in each treatment. All germinated plants per treatment were used for measurement of vegetative growth parameters as follows:-.

Germination percentage, germination index, plant height (cm) after 6 months in nursery, number of leaves/plant 45 days after planting, number of leaves/plant 6 months after planting. Leaf length and leaf width 6 months after planting.

Seed Germination was counted two times The first one after 30 days and the second one After 6 months. The germination index was counted as+ No. of seed germinated at first count divided by No. of days pus Seed germinated at second count divided by no. of days.

The data collected were statistically analyzed using M Stat computer software and means were separated by Duncan Multiple range Test (DMRT) Weber *et al*. (1966). **Results and Discussion**

Results in Table (1) showed that there was significant difference in germination % due to different seed storage periods and seed bed covering. The highest germination percent resulted from seeds planted after one week storage without covering treatment (80.0) followed by the 4 weeks storage without overing and one week storage with mango leaves covering (45.0). Plastic covering registered zero germination with all seed storage periods.

The results obtained agree with Chaudhari *et al.*, (2022) who reported that Jack fruit germination was affected by storage period and the germination percentage ranged between 81.6 for zero days to 53. For 10 days storage period. (Elevitch and Hareley, 2006) also obtained similar results. On the other hand, Gawankar *et al.* (2019) reported that growing media affected germination percentage, number of leaves, leaf girth and all vegetative growth of jackfruit. Zero germination may indicate that it keeps seed bed too moist and hot for normal germination.

Table (1): Effect of seed storage period and seed bed covering on Jack fruit germination percentage under River Nile State Conditions

Seed bed covering	**Planting after seed storage period**			
	At one week	**At 4 weeks**	**At 7 weeks**	**Mean**
Without covering	80.0	45.0	0.0	41.0
Mango leaf covering	45.0	13.0	0.0	19.0
White plaslic covering	0.0	0.0	0.0	0.0
Mean	41.0	19.0	0.0	
CV%	83.37			
Sig level	A***	B***		
SE±A	5.66			
SE±B	5.66			
SE±AB	9.81			

Results in Table (2) showed that there were significant differences in germination index as affected by seed storage periods and methods of covering. The highest germination index resulted from sowing after one week storage without covering treatment (0.031) followed by the 4 weeks storage period without covering and first week sowing with mango leaves covering (0.017). Plastic covering registered zero germination indexes from the three seed storage planting. Results obtained were in line with that of (Begum and Hague 2017) who found that the germination index significantly affected by the seed storage period.

Table (2): Effect of seed storage period and methods of seed bed covering on Jack fruit seed germination index after 6 months under River Nile State Conditions

Seed bed covering	**Planting after seed storage period**			
	At one week	**At 4 weeks**	**At 7 weeks**	**Mean**
Without c	0.031	0.017	0.000	0.016***
Mango leaf c	0.017	0.005	0.000	0.007**
White plaslic c	0.000	0.000	0.000	0.000***
Mean**	0.016	0.007	0.000	***
CV %	83.3			
Sig level	***	***		
SE± for facter A	0.0022			
SE± for facter B	0.0022			
SE± for AXB	0.0022			

Results in Table (3) indicated that number of leaves as counted 45 days after sowing were significantly affected by different seed storage period and covering methods, first week sowing without covering and with mango covering showed the highest number of leaves (4.0) followed by 4 weeks storage period (2.7). Chaudhari *et al.* (2022) obtained a greater number of leaves (6.8 to 5.8) in shorter storage period. He stated that number of leaves and germination percentage usually affected by seed storage period. Results obtained was also in line with Gawankar *et al.* (2019) who reported that growing media affected number of leaves, leaf girth and all vegetative growth of jackfruit.

Table (3): Effect of seed storage period and seed bed covering on Jack fruit number of leaves after 45 days under River Nile State Conditions.

Seed bed covering	**Planting after seed storage period**			
	At one week	**At 4 weeks**	**At 7 weeks**	**Mean**
Without c	4.0	2.7	0.0	2.2
Mango leaf c	4.0	1.3	0.0	1.8
White plaslic c	0.0	0.0	0.0	0.0
Mean	2.7	1.3	0.0	
CV%	79.06			
Sig level	***	***		
SE ± A	0.3514			
SE± B	0.3514			
SE±AB	0.3514			

Table (4) showed number of leaves as counted 6 months after sowing. There were significant differences between different periods of seed storage and covering methods, first week sowing without covering and with mango covering showed the highest number of leaves (9.667 and 9.333) followed by 4 weeks storage period without seed bd covering (7). Better growing conditions of uncovered and mango leave covered seed bed with good aeration may enhance increased number of leaves.

Table (4): Effect of seed storage period and seed bed covering on Jack fruit number of leaves after 6 months under River Nile State Conditions

Seed bed covering	Planting after seed storage period			
	At one week	**At 4 weeks**	**At 7 weeks**	**Mean**
Without c	9.667	7.000	0.000	6.667
Mango leaf c	9.333	3.000	0.000	5.444
White plaslic c	0.000	0.000	0.000	0.000
Mean	5.6	3.1	0.000	
CV%	85.95			
Sig level	***	****		
SE±A	0.9550			
SE± B	0.9550			
SE± AB	1.6541			

Results in table (5) showed that plant height (cm) as taken 45 days after sowing was significantly differing according to different periods of seed storage and covering methods, One week storage sown seeds without covering showed the highest plant height (51.7 cm) followed by one week stored seeds with mango covering. This result seems to be in line with that registered by (Elevitch and Hareley 2006) who reported that jackfruit reached 25 cm height within 3-4 moths and also agree with Gawankar *et al.* (2019) who reported that growing media affected all vegetative growth of Jackfruit and plant height range from 38-62cm at 60 days.

Table (5): Effect of seed storage period and seed bed covering on Jack fruit plant height (cm) after 6 months under River Nile State Conditions

Seed bed covering	Planting after seed storage period			
	At one week	**At 4 weeks**	**At 7 weeks**	**Mean**
Without c	51.7	36.0	0	29.2
Mango leaf c	38.3	18.7	0	19.0
White plaslic c	0.0	0.0	0.0	0.0
Mean	30.2	18.0	0.0	
CV%	104.50			
Sig leve				
SE± A*	5.554			
SE± B N.S	5.554			
SE± AB	9.6948			

Leaf width (cm) as counted 6 months after sowing was significantly differ according to periods of seed storage and covering methods (Table6), one week stored seeds with mango covering showed the highest leaf width (4.8) followed by one week stored seeds without covering (4.7).

Results obtained seem to agree with Gawankar *et al.* (2019) who reported that growing media affected all vegetative growth of jackfruit

Table (6): Effect of seed storage period and seed bed covering on Jack fruit leaf width (cm) in 6 months after planting under River Nile State Conditions

Seed bed covering	Planting after seed storage period			
	At one week	At 4 weeks	At 7 weeks	Mean
Without c	4.7	3.3	0.0	4.0
Mango leaf c	4.8	1.3	0.0	3.5
White plaslic c	0.0	0.0	0.0	0.0
Mean	4.75	2.3	0.0	3.75
CV%	75.49			
Sig level	***	***	**	
SE±A	0.3961			
SE± B	0.3961			
SE±AB	0.6861			

Results in Table (7) showed significant differences between leaf length as affected by seed storage period and seed bed covering. The greater leaf length (18.0 cm) resulted in one week storage with mango leaves covering, followed by one week storage without covering. Result obtained agree with that of)Petruzzello 2023) who reported the jackfruit tree has large stiff glossy green leaves about 15 to 20 cm long and with Gawankar *et al.* (2019).

Table (7): Effect of seed storage period and seed bed covering on Jack fruit leaf length (cm) in 6 month after planting under River Nile State Conditions

Seed bed covering	Planting after seed storage period			
	At one week	At 4 weeks	At 7 weeks	Mean
Without c	15.0	10.0	0.0	8.3
Mango leaf c	18.0	4.7	0.0	7.6
White plaslic c	0.0	0.0	0.0	0.0
Mean	11.0	4.9	0.0	
C.v	76.59			
Sig level	***	***	**	
SE±A	1.3521			
SE± B	1.3521			

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