JUATIKA
JURNAL AGRONOMI TANAMAN TROPIKA
VOL. 7 NO. 3 September 2025
DOI :https://doi.org/10.36378/juatika.v5i2.4455
eissn 2656-1727
pissn 2684-785X
pages : 822 – 827

RESEARCH ARTICLE Open Access

Influence of Storage Media Type and Duration on the Viability of Longan Seeds (*Dimocarpus longan* L.)

Moch. Ari Baha'udin[1], Nova Triani[1,*], Sutini[1]

Abstract

Longan fruit is in high demand; however, longan plants produce recalcitrant seeds, which are less resistant to drying and contain higher moisture levels than orthodox seeds. Recalcitrant seeds typically remain viable for only 3-5 days if not stored under optimal conditions. This study aimed to determine the optimal combination of organic storage media and storage duration for maintaining longan seed viability. The first factor was the type of organic storage medium (sawdust, cocopeat, and rice husk charcoal), and the second was the storage duration (7, 14, 21, and 28 days). The parameters observed included germination power, sprout length, sprout weight, maximum growth potential, and sprout root length. A Completely Randomized Design (CRD) was employed, and the data were analyzed using ANOVA. When significant effects were detected, a post-hoc BNJ test at the 5% level was conducted. The analysis revealed no significant interaction between storage media type and duration on any parameter. The storage medium had no significant effect, whereas storage duration significantly affected germination power, sprout length, and sprout weight, but not maximum growth potential or root length. Seeds stored for 7 days performed better than those stored for 28 days. Control seeds (without storage) exhibited the best overall results. This study suggests that longan seeds can be stored for up to 7 days while maintaining optimal viability, which is useful for seed distribution and commercial cultivation.

Keywords: Cocopeat, Longan Seeds, Recalcitrant Seeds, Rice Husk Charcoal, Sawdust

1. Introduction

Longan (*Dimocarpus longan* L.) is a perennial plant native to Southeast Asia, and its fruit is widely favored in Indonesia. Demand for longan fruit continues to increase annually, reflecting its high commercial value. However, the high market price limits accessibility, and the scarcity of seedlings poses a challenge to cultivation. Increasing longan seedling production is therefore essential to meet both national and international demands.

Longan seedlings can be propagated either generatively, through seeds, or vegetatively, via grafting, budding, and cuttings. Generative propagation, however, is constrained by seed availability, as longan seeds are recalcitrant and prone to rapid deterioration under environmental stress, which reduces quality.

Recalcitrant seeds are characterized by high water content and a lack of resistance to drying or high-temperature stress, as well as relatively low temperatures. These seeds can only be stored for a relatively short period of time, ranging from 3 to 5 days. Recalcitrant seeds have a fairly high water content, ranging from 20% to 35%. If the seeds experience a decrease in water content, they cannot maintain their viability. Therefore, to maintain their viability, these recalcitrant seeds require storage with optimal temperature and humidity. According to Tambunsaribu et al. (2017), storage of recalcitrant seeds generally requires a temperature range of 4ºC - 20ºC, depending on the species, with high humidity room conditions (RH 70% - 90%). In addition, the use of organic storage media can be applied in storing recalcitrant seeds, because it can maintain seed water content for a longer period.

Seed storage media is a material used to store seeds to maintain seed quality over a long period of storage. Types of organic storage media come from the processing of plant biomass, such as sawdust, *cocopeat*, and rice husk charcoal.

*Correspondence: novatriani.agrotek@upnjatim.ac.id
1) Universitas Pembangunan Nasional "Veteran" Jawa Timur - Jl. Raya Rungkut Madya Gunung Anyar Surabaya 60294, Indonesia

Seed storage media can absorb and bind water to maintain humidity, thereby maintaining seed moisture content, maintaining seed viability, and extending storage time. In the study of Kusmana et al. (2011), *cocopeat* is a storage medium with a decrease in seed moisture content of 1.57% with an initial moisture content of 40.84%. According to Pratiwi et al. (2011) in Tambunsaribu et al. (2017), storing longan seeds (*Dimocarpus longan* Lour.) using rice husk charcoal and sawdust storage media can maintain water content of 51.66% and 51.08% respectively, with seed germination of 72.08% and 68.75% and a storage time of 30 days. In this study, the types of storage media used were *cocopeat*, rice husk charcoal, and sawdust. Cocopeat storage media is used because it has a high water retention capacity, which helps maintain the water content of the seeds.

Longan seeds can be detrimental to their longan seed storage. The longer they are stored, the more likely they are to deteriorate. Longer storage can result in decreased seed quality. This decline in seed quality is caused by moisture content that is too low or too high. According to Pratiwi *et al.* (2012), seeds stored using media can maintain their viability for up to 20 days of storage because the seed germination power after 20 days of storage is less than 80%. This finding is a factor in seed growth, because seeds stored for longer will die if they do not use optimal storage media. In the study, providing storage duration treatment with 7-day intervals, namely 7, 14, 21, and 28, or longer than the study, is expected to provide optimal storage duration results for longan seed growth.

Research on seed storage using various types of organic storage media and different storage durations aims to determine the optimal treatment for organic storage media types and storage durations on longan seed viability.

2. Material and Methods

2.1. Time and Place

The research was conducted from February 2025 to April 2025. The study was conducted in the Crop and Plant Production Laboratory—*Greenhouse* Faculty of Agriculture, Veteran National Development University of East Java, Gunung Anyar, Surabaya City. Location coordinates -7.3344954, 112.7913258 . The altitude of Surabaya city is between 3 and 6 meters above sea level.

2.2. Tools and materials

The tools and materials used included 15 × 15 cm polybags, 15 × 22 cm aluminum foil, trowels, analytical scales, nursery tubs, autoclaves, ovens, desiccators, crucibles, measuring cups, research labels, rulers, 5 L buckets, and counters. The materials were longan seeds, rice husk charcoal, sawdust, cocopeat, compost, clay, sand, cardboard, fungicide (Dithane M-45), and water.

2.3. Research methods

This study was a factorial experiment designed using a Completely Randomized Design (CRD). The first factor was the type of organic storage media, which consisted of three kinds: sawdust and *cocopeat,* and rice husk charcoal. The second factor is the storage period, which consists of 4 types: 7 days, 14 days, 21 days, and 28 days. Each treatment was repeated 3 times—the control treatment involved direct sowing and planting seeds without any treatment of storage media or storage duration. The control treatment was repeated 3 times.

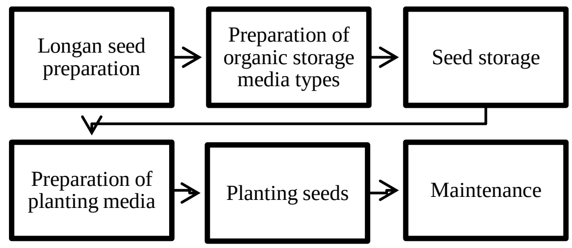

Figure 1. Research flow diagram

2.4. Data analysis

Data were analyzed using ANOVA to test treatment effects. When significant differences were found, comparisons were conducted using the Honestly Significant Difference (HSD) test at the 5% level. Statistical analyses were performed in Microsoft Excel 2019.

3. Results and Discussion

The combination of organic storage media and storage duration did not provide significant interaction on all observation parameters. This result occurred because the treatment of organic storage media and the storage duration of longan seeds could have separate effects, resulting in different responses from longan plant seeds. This result indicates that the two treatments are not interdependent and can be applied singly. The treatment of organic storage media did not provide a significant effect on all parameters; this finding could be influenced by the similarity of the 30% humidity factor given to all organic storage media, so it did not reduce the water content of longan seeds in the given storage period, but it did lessen all viability and growth results of longan seedlings. The treatment of seed storage duration had a significant effect on the parameters of germination power, sprout length, and sprout weight, but had no significant impact on the parameters of maximum growth potential and sprout root length.

3.1. Germination Power

The results of the analysis of variance showed that the combination of organic storage media type and longan seed storage time had no significant effect on the germination capacity of longan seeds. The treatment of storage media type did not have a considerable impact on the germination capacity of longan seeds, while the treatment of longan seed storage time had a substantial effect on the germination capacity. The average value of longan seed germination capacity for the single factor of organic storage media type and longan seed storage time is presented in Table 1.

Table 1. Average Germination Power of Longan Seeds in Organic Storage Media Type and Storage Duration Treatments.

Treatment	Germination test (%)
control	86.67 ± 4.05
Storage media	
Sawdust	64.08 ± 5.63
Cocopeat	57.50±9.52
Rice husk charcoal	60.83± 9.14
BNJ 5%	Mr.
Storage period	
7 days	79.33 ± 2.08 b
14 days	64.22 ± 2.23 ab
21 days	52.22 ± 3.05 ab
28 days	46.67± 4.15 a
BNJ 5%	31.18

Description: The average value followed by the same letter in the same treatment shows no significant difference in the 5% BNJ test; tn=not significant.

Table 1 shows that the treatment of organic storage media types on the germination power of longan seeds is not significantly different. The results of the storage time treatment on germination power show significantly different results. The results of a single treatment of longan seed storage time on the percentage of germination power showed the highest average results in the 7-day storage time treatment, at 79.33%, which is significantly different from the 28-day storage time treatment, at 46.67%. Storage times for 14 and 21 days, namely 64.22% and 52.22%, are not significantly different from storage times for 7 and 28 days, namely 79.33% and 46.67%. The control treatment exhibits a higher average germination power percentage, at 86.67%, compared to the treatment with a storage time of 7-28 days. This result differs from the results of research by Pratiwi et al. (2012), which stored longan seeds on germination power at a humidity level of 30% for 5 days, achieving a germination rate of 97.91%. These results are higher than those in this study, as the storage medium used in that study weighed 200 grams and was given 30% humidity or 90 ml of water, compared to the 500 grams of storage medium given 30% humidity or 150 ml of water. This humidity affects the water content of longan seeds, thus affecting their germination rate.

A 7-day storage treatment yielded the highest yield compared to a 28-day storage period. This result is thought to be due to seed deterioration during storage, resulting in decreased germination. According to Pramono *et al.* (2019), the storage period of a seed needs to be considered because the longer the seeds are stored, the more they will continually experience chronological deterioration. Seed deterioration is related to enzyme activity in seed metabolism. This finding causes increased membrane permeability, which occurs because the cell membrane is incomplete.

Organic storage media treatment. This finding occurs because the longer the seed is stored, the lower its viability. Seven days of storage yielded higher germination rates than other storage periods. According to Ayu *et al.* (2023), during this storage period, the cell structure remains undamaged, and the seeds retain their ability to absorb water, enabling them to carry out embryonic cell metabolism.

3.2. Maximum Growth Potential

The results of the analysis of variance showed that in the combination of the type of organic storage media treatment with the storage time of longan seeds, there was no significant effect on the maximum growth potential of longan seeds. The treatment of the type of storage media did not have a substantial impact on the maximum growth percentage of longan seeds, while the treatment of the storage time of longan seeds did not have a significant effect on the maximum growth percentage. The average maximum growth percentage of longan seeds, as influenced by the type of organic storage media and storage time, is presented in Table 2.

Table 2. Average Maximum Growth Potential of Longan Seeds in Organic Storage Media Type and Storage Duration Treatments.

Treatment	Maximum growth potential (%)
control	86.67± 4.05
Storage media	
Sawdust	86.00 ± 2.04
Cocopeat	75.50 ± 3.24
Rice husk charcoal	83.33 ± 3.32
BNJ 5%	Mr.
Storage period	
7 days	99.11 ± 0.59
14 days	84.67 ± 0.97
21 days	74.22 ± 1.19
28 days	68.44 ± 2.16
BNJ 5%	Mr.

Description: tn=not real.

Table 2 shows that the single treatment of organic storage media type on the maximum growth potential of longan seeds was not significantly different. The results of the single treatment of storage duration on the maximum growth potential showed no significant difference. The results of the maximum growth percentage of longan seeds in the control treatment showed higher results, namely 86.67%, compared to the single treatment of sawdust, cocopeat, and rice husk charcoal storage media, and higher than the single treatment of 14-28 days of storage. The maximum growth potential of the 7-day storage treatment showed higher results than the control treatment, namely 99.11%. This result differs from the research of Nurhayani & Wulandari (2019), where the treatment of ylang-ylang seeds without storage (control) yielded the highest germination percentage, namely 54%. Seeds without storage and seeds stored in *cocopeat media* had germination percentages and maximum growth potential that were not significantly different.

Seeds stored for 7 days are suspected of undergoing imbibition and have not experienced seed deterioration. According to Idrus & Fuadiyah (2021), imbibition is the process of water absorption by the surface of hydrophilic substances, such as protein, starch, cellulose, and others, which causes these substances to expand after absorbing water. During water absorption in the seeds, water enters the cotyledons, increasing their volume and causing them to swell. The swelling that occurs in the seeds ultimately causes the testa to rupture. This imbibition event causes seeds stored for 7 days to have active cells for germination.

3.3. Sprouts Length

The results of the analysis of variance showed that in the combination of the type of organic storage media treatment with the storage time of longan seeds, there was no significant effect on the length of longan plant shoots. The type of storage media had no significant impact on the length of longan plant shoots, whereas the storage time of longan seeds had a substantial impact. The average value of the length of longan plant shoots in the single factors of the type of organic storage media treatment and the storage time of longan seeds is presented in Table 3.

Table 3. Average Value of Longan Plant Sprout Length in Organic Storage Media Type and Storage Duration Treatments.

Treatment	Sprout length (cm)
control	24.72 ±1.56
Storage media	
Sawdust	23.13 ± 0.57
Cocopeat	21.70 ± 0.45
Rice husk charcoal	23.09 ± 0.58
BNJ 5%	Mr.
Storage period	
7 days	23.69 ± 0.86 b
14 days	22.93 ± 0.35 ab
21 days	22.98 ± 0.44 ab
28 days	20.96 ± 0.48 a
BNJ 5%	1.98

Description: The average value accompanied by the same letter in the same treatment shows no significant difference in the 5% BNJ test; tn=not significant.

Figure 2. Treatment of storage media types of sawdust (M1), *cocopeat* (M2), and rice husk charcoal (M3) stored for 7-28 days on the length of the sprouts

Table 3 shows that the single treatment of organic storage media type on the length of longan plant shoots was not significantly different. The results of the storage time treatment on the length of longan plant shoots were significantly different. The results of the seed storage time treatment on the length of shoots with the highest average results in the 7-day storage treatment, namely 23.69 cm, which was significantly different from the 28-day storage treatment, namely 20.96 cm, but not substantially different from the 14- and 21-day storage treatments, namely 22.93 and 22.98 cm. Observations of the length of shoots in the control treatment showed a higher result, namely 24.72 cm, compared to all treatments. These results are in line with Yazid's research (2020). Likewise, the plant height parameter also decreased in 20-day storage with an average of 34.20 cm compared to 10-day storage, namely 34.33 cm. The decrease in seed germination power and growth rate is one of the benchmarks for assessing seed viability and has an impact on plant height growth.

A 7-day storage period yielded the best seedling length compared to a 28-day storage period. This result is due to various factors, including seed germination capacity, which influences the sprouting ability. Decreased seed germination during storage is closely related to high water content, which causes the mitochondrial membrane structure to become irregular, resulting in metabolites being released from the cell (Subantoro, 2014).

The length of the sprout is influenced by the length of the roots and the number of roots, which function to absorb water and nutrients from the growing medium, thus promoting sprout growth. According to Hayati & Setiono (2021), germination energy is the result of the assimilation of substances such as carbohydrates, fats, and proteins, which are then translocated to the growing point, resulting in germination and growth.

The seed's growth rate influences the length of the sprout, thus providing the best sprout length. The higher the seed's growth rate, the longer the resulting sprout. Payung et al. (2012), as cited in Tokan et al. (2024), stated that stored seeds continue to undergo perfect physiological embryo maturation, thereby increasing their readiness to germinate.

3.4. Length of sprout roots

The results of the analysis of variance showed that in the combination of the type of organic storage media treatment with the storage time of longan seeds, there was no significant effect on the length of the longan plant sprout roots. The single factor of the type of storage media had no significant impact on the length of the longan plant sprout roots, while the single factor of the storage time of longan seeds had no significant effect on the length of the longan plant sprout roots. The average value of the longan plant sprout root length, in relation to the type of organic storage media and the storage time of longan seeds, is presented in Table 4.

Table 4. Average Root Length of Longan Plant Sprouts in Organic Storage Media Type and Storage Duration Treatments.

Treatment	Length of sprout root (cm)
control	12.11 ± 1.12
Storage media	
Sawdust	10.57 ± 0.41
Cocopeat	9.82 ± 0.46
Rice husk charcoal	10.95 ± 0.51
BNJ 5%	Mr.
Storage period	
7 days	11.13 ± 0.51
14 days	10.96 ± 0.50
21 days	10.38 ± 0.49
28 days	9.30 ± 0.53
BNJ 5%	Mr.

Description: tn=not real.

Table 4 shows that the single treatment of storage media type on the length of longan plant sprout roots was not significantly different. The results of the single treatment of storage duration on the length of longan plant sprout roots were not significantly different. Observations of the length of sprout roots in the control treatment showed a higher result, namely 12.11 cm, compared to all treatments.

The control treatment yielded higher yields compared to all other treatments. This result is thought to be due to seed deterioration, resulting in suboptimal seed cell tissue conditions for growth. According to Noya *et al.* (2018), symptoms of seed deterioration can be observed in seed biochemistry, such as enzyme activity, respiration rate, and metabolite leakage. Seed deterioration results in low germination rates, delayed germination, slow seedling growth, loss of field growth potential, decreased resistance to environmental stress, yield loss, and an increased number of abnormal seedlings.

3.5. Sprouts Weight

The results of the analysis of variance showed that in the combination of the type of organic storage media treatment with the storage time of longan seeds, there was no significant effect on the weight of longan plant sprouts. The type of storage media had no substantial impact on the weight of longan plant sprouts, whereas the storage time of longan seeds significantly impacted the weight of longan plant sprouts. The average weight of longan plant sprouts, categorized by the type of organic storage media treatment and storage time, is presented in Table 5.

Table 5. Average Weight of Longan Plant Sprouts in Organic Storage Media Type and Storage Duration Treatments.

Treatment	Weight of sprouts (grams)
control	2.32 ± 0.10
Storage media	
Sawdust	2.23 ± 0.04
Cocopeat	2.13 ± 0.05
Rice husk charcoal	2.17 ± 0.05
BNJ 5%	Mr.
Storage period	
7 days	2.28 ± 0.02 b
14 days	2.26 ± 0.02 b
21 days	2.19 ± 0.04 ab
28 days	1.96 ± 0.04 a
BNJ 5%	0.13

Description: The average value accompanied by the same letter in the same treatment shows no significant difference in the 5% BNJ test; tn=not significant.

Table 4.5 shows that the single treatment of storage media type on the weight of longan plant sprouts was not significantly different. The results of the single treatment of storage duration on the weight of longan plant sprouts were significantly different.

The results of the single treatment of seed storage time on the weight of the sprouts with the highest average results in the treatment of storage time for 7 days, namely 2.28 g, which was significantly different from the treatment of storage for 28 days, namely 1.96 g and not substantially different from the treatment of storage for 14 and 21 days with an average weight of 2.26 g and 2.19 g. This finding aligns with the research by Nurhayati et al. (2015), which indicates that storing rubber seeds for 2 weeks results in the highest average wet weight of 33.60 g, followed by a decrease in gross weight over the 0-8 week period.

Observations of the weight of the sprouts in the control treatment showed a higher result of 2.32 g compared to all treatments. A storage period of 7 days gave the highest result compared to a storage period of 28 days. The speed of seed sprout growth influences this. The faster the seed germination power, the higher the sprout length, root weight, root length, and plumule length. According to Nurhayati *et al.* (2015)**,** the longer the storage period, the shorter the sprouts produced and the lower the germination rate, so that the fresh weight of the sprouts decreases with the longer the storage period. During storage, the seeds experience a decline in germination, resulting in short sprouts and a reduced germination rate.

4. Conclusion

There was no significant interaction between storage medium and storage duration on the viability of longan seeds. Storage medium type did not affect any parameter, whereas storage duration significantly affected germination power, sprout length, and sprout weight. Seeds stored for 7 days maintained higher viability and growth than those stored for 28 days. Control seeds exhibited the best results overall. These findings suggest that longan seeds can be safely stored for up to 7 days, supporting sustainable cultivation and facilitating seed distribution over longer distances.

References

Ayu, E. K., Fatimah, T., & Salim, A. (2023). Pengaruh lama penyimpanan menggunakan media arang sekam padi terhadap perkecambahan benih kakao hibrida. *Agropross: National Conference Proceedings of Agriculture*, 424–432. https://doi.org/10.25047/agropross.2023.513

Hayati, N., & Setiono. (2021a). Pengaruh lama penyimpanan terhadap viabilitas benih kedelai (*Glycine max* (L.) Merrill) varietas anjasmoro. *Jurnal Sains Agro, 6*(2), 66–76. https://doi.org/10.36355/jsa.v6i2.655

Hayati, N., & Setiono. (2021b). Pengaruh lama penyimpanan terhadap viabilitas benih kedelai (*Glycine max* (L.) Merrill) varietas anjasmoro effect. *Jurnal Sains Agro, 2*(2015), 44–54.

Idrus, H. A., & Fuadiyah, S. (2021). Uji coba imbibisi pada kacang kedelai (*Glycine max*) dan kacang hijau (*Vigna radiata*). *Prosiding SEMNAS BIO 2021, 1*(4), 710–716. https://doi.org/10.24036/prosemnasbio/vol1/93

Kusmana, C., Kalingga, M. F., & Syamsuwida, D. (2011). Pengaruh media simpan, ruang simpan, dan lama penyimpanan terhadap viabilitas benih *Rhizophora stylosa* Griff. *Jurnal Silvikultur Tropika, 3*(1), 82–87.

Noya, M., Riry, J., & Lesilolo, M. (2018). Pengaruh media dan periode simpan terhadap viabilitas benih cengkeh tuni (*Syzygium aromaticum* L.). *Jurnal Budidaya Pertanian, 14*(2), 97–104. https://doi.org/10.30598/jbdp.2018.14.2.97

Nurhayani, F. O., & Wulandari, A. S. (2019). Pengaruh periode dan media simpan terhadap viabilitas benih kenanga (*Cananga odorata* (Lam.) Hook.f. & Thomson forma genuina). *Jurnal Sylva Lestari, 7*(3), 277–288. https://doi.org/10.23960/jsl37277-288

Nurhayati, Basuki, N., & Ainurrasyid. (2015). Pengaruh lama dan media penyimpanan benih terhadap perkecambahan karet (*Hevea brasiliensis* Müll. Arg.). *Jurnal Produksi Tanaman, 3*(7), 607–614. https://protan.studentjournal.ub.ac.id/index.php/protan/article/view/241

Pramono, E., Kamal, M., Setiawan, K., & Tantia, M. A. (2019). Pengaruh lama simpan dan suhu ruang penyimpanan pada kemunduran dan vigor benih sorgum (*Sorghum bicolor* [L.] Moench.) varietas Samurai-1. *Jurnal Agrotek Tropika, 7*(2), 383. https://doi.org/10.23960/jat.v7i2.3261

Subantoro, R. (2014). Studi pengujian deteriorasi (kemunduran) pada benih kedelai. *Mediagro, 10*(1), 23–30. https://doi.org/10.33379/gtech.v5i1.681

Tambunsaribu, D. W., Anwar, S., & Lukiwati, D. R. (2017). Viabilitas benih dan pertumbuhan bibit kakao (*Theobroma cacao* L.) pada beberapa jenis media simpan dan tingkat kelembaban. *Journal of Agro Complex, 1*(3), 135. https://doi.org/10.14710/joac.1.3.135-142

Tokan, O. B. G. T., Seran, W., & Kaho, N. P. L. R. (2024). Efektivitas lama penyimpanan dan beberapa media simpan organik terhadap viabilitas benih mahoni (*Swietenia macrophylla* King). *Jurnal Celebica: Jurnal Kehutanan Indonesia, 5*(1), 83–96. https://doi.org/10.33772/jc.v5i1.41

Yazid, A. (2020). Viabilitas benih karet pada beberapa media simpan dan lama penyimpanan yang berbeda. *Agrium, 22*(3), 137–141. https://doi.org/10.30596/agrium.v22i3.4684