AGROLAND: The Agricultural Sciences Journal
Vol. 7, No. 1 June (2020), 54 - 60
P-ISSN : 2407- 7585 & E-ISSN : 2407- 7593, Published by Tadulako University

Original Research **Open Access**

IMPROVEMENT OF GOGO RICE SEEDS THROUGH ADAPTIVE LOCATIONS AND STORAGE

Mustakim[1)], Sakka Samudin[1)], Maemunah[1*)]Adrianton[1)]dan Yusran[2)]

[1)] Program Study of Agrotechnology Faculty of Agriculture University of Tadulako
[2)] Laboratory assistant Faculty of Agriculture University of Tadulako

Correspondence author's: Maemunah
Email : maemunah.tadulako2@gmail.com

Submit: 15 March 2020, Revised: 20 Marcht 2020, Accepted: 1 June 2020

ABSTRACT

Production and management technologies are needed to produce great seeds. This study aims to obtain the location and length of time to store upland rice seeds. The study was conducted in Tamarenja and Kalukubula villages. Germination testing was carried out at the Seed Science and Technology Laboratory of the Faculty of Agriculture from May to December 2019. The seeds used were newly harvested seeds from the field. The treatment used a randomized two-factor block design. The first factor was storage locations: indoor Tamarenja, outdoor Tamarenja, indoor Kalukubula and outdoor Tamarenja. The second factor consisted of two storage times, namely: one month and two months. The treatments repeated six times, so there were 48 experimental units where each experimental unit contains 50 seeds, and the whole seeds used were 2,400. Data analysis used Fisher's test and continued with 1% Tukey's HSD test. The results showed that the best storage location was in Kalukubula, both outdoors and indoors. The best storage time was two months. Those produced the highest germination capacity and growth potential and faster germination time, percentage of moldy seeds, and moldy sprouts.

Keywords: Paddy Seeds, Storage location, Storage time

DOI: https://doi.org/10.22487/agroland.v6i1.3

INTRODUCTION

The management of the harvested planting material that will be used for the next seasons is essential. Newly harvested rice still has a high enough moisture content. Therefore special handling is needed to reduce moisture and maintain the seeds (Kartahadimaja et al. 2013.)

The study results presented by Dewi (2015) showed that the combination of location and storage time had a different effect in the increase moisture content and seed weight, but had no significant effect on seed growth and seed damage. Storage for three months gave high moisture content compared to control and storage for one month.

Drying using erratic sunlight can reduce the water content to the lowest water content and damage the embryos in the seeds, and therefore the seeds unable to grow (Bettaieb et al. 2019). Sun-drying can also time consuming for farmers since dried seeds will always be considered and monitored from animals that can damage and eat the dried seeds (Khalil et al. 2014; Panggabean et al. 2017)

Drying with storage technology is an approach that can be introduced to the farmers to avoid the obstacles mentioned above (Rachmat, 2008). Research on the location and length of storage time after harvesting is fundamental to produce great seeds that will be used as the next planting material (Nugraha 2012). This study was conducted to find the location and length of time to store upland rice seeds to produce great seeds.

MATERIALS AND METHODS

This study was carried out in the village of Tamarenja (Kalama) at an altitude of 180-250 masl and in Kalukubula village at an altitude of <50 masl, and the germination test was carried out at the Laboratory of Seed Science and Technology. This research was conducted from May to December 2019.

This research was a randomized block design with a two-factors. The first factor consisted of four storage locations, namely: P1 = indoor Tamarenja, P2 = outdoor Tamarenja, P3 = indoor Kalukubula, and P4 = outdoor Kalukubula. While the second factor consisted of two storage times: W1 = one month and W2 = two months. All treatments were repeated six times so that there were 48 experimental units where each experimental unit contains 50 seeds, and the total seeds used were 2,400 seeds.

Seed germination using the test on paper (Sadjad and Suseno 1972). The parameters observed were germination capacity, growth potential, germination time, percentage of moldy seeds, and percentage of moldy sprouts were calculated on day 14 using the formula below (Sadjad et al. 1997).

$$\text{DB} = \frac{Normal\ germinated\ seeds}{Number\ of\ seeds} x\ 100$$

$$\text{PTM} = \frac{Germinated\ seeds}{Number\ of\ seeds} x100$$

$$\text{Time of germination} = \frac{N1.T1 + N2.T2 + \cdots Ni.Ti}{Benih\ yang\ dikecambahkan}$$

where:

N1 = germinated seed

T1 =day germinated

Ni = germinated seed in the next day

Ti = the next day (time) for germination

$$\text{Moldy seed} = \frac{Number\ of\ \text{moldy seed}}{Number\ of\ seed} x\ 100$$

$$\text{Moldy germinated seed} = \frac{\text{Moldy germinated seed}}{Number\ of\ seed} x\ 100$$

RESULTS AND DISCUSSION

Germination Seed

The results of the Tukey HSD test showed that the storage treatment in Tamarenja indoors and outdoors, as well as storage in Kalukubula indoors for two months, produced the highest germination capacity and was significantly different from other treatments for one month. For two months, the seeds stored in Kalukubula outdoors produced the highest germination capacity but not significantly different from storage for one month.

For one month, storage resulted in higher germination and significantly different from other treatments, except storage in indoor Kalukubula. Storage for two months resulted in a higher germination rate, but it was not significantly different from the other treatments, except for the indoor storage treatment in Tamarenja.

Germination Time

The results of the Tukey HSD test at the 1% level showed that the storage treatment at outdoor and indoor Tamarenja and storage at indoor and outdoor Kalukubula, which were stored for two months, resulted in faster germination time and significantly different from storage for one month. However, storage in Kalukubula for two months was not significantly different from storage for one month.

For one month, storage resulted in a faster germination time in indoor Kalukubula and significantly different from other treatments, except for storage treatment in outdoor Kalukubula. Storage for two months resulted in a faster germination time in outdoor Kalukubula but was not significantly different from other treatments.

Potential to Grow

The results of the Tukey's HSD test 1% level showed that the storage treatment in outdoor and indoor Tamarenja and indoor Kalukubula produced the highest growth potential in the second month and was significantly different from other treatments, except with indoor storage in Kalukubula. Storage in outdoor Kalukubula produced the highest growth potential in the first month, but not significantly different from the second months growth potential.

Storage for one month resulted in the potential for growth in outdoor Kalukubula and was significantly different from other treatments, except storage in indoor Kalukubula. Storage for two months resulted in the highest growth potential in indoor Kalukubula storage, but it was not significantly different from other treatments.

Table 1. Germinated seed (%).

Location \ Time	One Month	Two Months	Tukey's HSD test 1%
Tamarenja indoor	$_{p}11.00^{a}$	$_{q}50.33^{a}$	13.40
Tamarenja outdoor	$_{p}29.00^{ab}$	$_{q}70.00^{ab}$	
Kalukubula indoor	$_{p}61.67^{bc}$	$_{q}93.00^{b}$	
Kalukubula outdoor	$_{p}85.67^{c}$	$_{p}92.33^{b}$	
Tukey's HSD test 1%	33.74		

Note: Numbers followed by the same letter was not indicate differences.

Table 2. Germination time (Days)

Location \ Time	One Month	Two Months	Tukey's HSD test 1%
Tamarenja indoor	$_{q}5.66^{c}$	$_{p}2.22^{a}$	0.61
Tamarenja outdoor	$_{q}4.81^{bc}$	$_{p}2.43^{a}$	
Kalukubula indoor	$_{p}2.79^{a}$	$_{p}2.42^{a}$	
Kalukubula outdoor	$_{q}3.24^{a}$	$_{p}2.12^{a}$	
Tukey's HSD test 1%	1.53		

Note: Numbers followed by the same letter was not indicate differences.

Table 3. Growth Potential of the seed (%)

Location \ Time	One Month	Two Months	Tukey's HSD test 1%
Tamarenja indoor	$_{p}70.67^{a}$	$_{q}87.33^{a}$	7.65
Tamarenja outdoor	$_{p}51.67^{a}$	$_{q}85.67^{a}$	
Kalukubula indoor	$_{p}92.67^{bc}$	$_{p}96.67^{a}$	
Kalukubula outdoor	$_{p}98.67^{c}$	$_{p}96.00^{a}$	
Tukey's HSD test 1%	19.26		

Note: Numbers followed by the same letter was not indicate differences.

Table 4. Percent of moldy seeds (%).

Location \ Time	One Month	Two Months	Tukey's HSD test 1%
Tamarenja indoor	$_{q}5.50^{bc}$	$_{p}3.64^{a}$	1.01
Tamarenja outdoor	$_{q}6.82^{c}$	$_{p}3.10^{a}$	
Kalukubula indoor	$_{q}3.14^{ab}$	$_{p}1.69^{a}$	
Kalukubula outdoor	$_{p}1.00^{a}$	$_{p}146^{a}$	
Tukey's HSD test 1%	2.54		

Note: Numbers followed by the same letter was not indicate differences.

Table 5. Percent of moldy sprouts (%)

Location \ Time	One Month	Two Months	Tukey's HSD test 1%
Tamarenja indoor	$_{q}7.78^{b}$	$_{p}4.46^{a}$	1.31
Tamarenja outdoor	$_{p}4.63^{a}$	$_{p}3.91^{a}$	
Kalukubula indoor	$_{q}5.48^{ab}$	$_{p}2.07^{a}$	
Kalukubula outdoor	$_{p}2.42^{a}$	$_{p}2.07^{a}$	
Tukey's HSD test 1%	3,30		

Note: Numbers followed by the same letter was not indicate differences.

Percent of Moldy Seeds

Tukey's HSD test 1% level showed that storage in outdoor and indoor Tamarenja and indoor Kalukubula resulted in a lower percentage of moldy seeds in the second month and significantly different from the percent of moldy seeds in the first month. The storage treatment in outdoor Kalukubula resulted in a lower percentage of moldy seeds but not significantly different from the percentage of moldy seeds in the second month.

The first month of seed storage resulted in a lower percentage of moldy seeds in outdoor Kalukubula and significantly different from other treatments except for storage in indoor Kalukubula. Storage of seeds In the second month, the least percentage of moldy seeds was found in the storage treatment in outdoor Tamarenja, but it was not significantly different from other treatments.

Percent of Moldy Sprouts

The results of the Tukey's HSD test at the level of 1%, showed that storage in indoor Tamarenja and storage in indoor Kalukubula in the second month resulted in a lower mean percent value of moldy sprouts and was significantly different from storage for one month. In the second month, storage in outdoor Kalukubula also resulted in a lower percentage of moldy sprouts, but not significantly different from storage for one month.

For one month, storage resulted in a higher percentage of moldy sprouts in the storage treatment in indoor Tamarenja and was significantly different from other treatments except for storage in indoor Kalukubula. Meanwhile, storage in outdoor Kalukubula resulted in a smaller percentage of moldy sprouts, but it was not significantly different from other treatments except for storage in indoor Tamarenja.

Storage for two months resulted in a lower percentage of moldy sprouts in outdoor Kalukubula storage, but it was not significantly different from other treatments, and storage in indoor and outdoor Kalukubula resulted in the same mean value of moldy sprouts.

This study highlighted that storage time and location had a very significant effect on all experimental parameters. The rice seeds stored in Tamarenja produced an average value for germination, lower potential for growth, and longer germination time than those stored in Kalukubula. This is presumably because the average daily temperature in Tamarenja is lower than that in Kalukubula (Fachruri et al. 2019). The low-temperature results in the process of respiration of the seeds running slowly, resulting in lower germination and growth potential and longer germination time (Dewi, 2015).

Storage for two months results in the highest germination capacity and growth potential, faster germination time, and a smaller percentage of moldy seeds and a smaller percentage of moldy sprouts. This is due to a decrease in water content, where water plays a role in the process of seed metabolism, especially respiration (Novitasari and Ernawati, 2017). Respiration is a catabolic reaction process that breaks down sugar molecules into carbon dioxide (CO_2) and water (H_2O) (Bhatt et al. 2019; Kibet et al. 2019; Yuniarti et al. 2013). Higher water content can interfere with the process of seed metabolism so that seed germination becomes disrupted and triggers the growth and development of fungi (Dewi, 2015).

The interaction between storage location and storage time can increase germination and potential for growth as well as faster germination time this is because the seeds stored with storage time can reduce the water content in the seeds so that metabolic processes run well (Novitasari and Ernawati 2017; Millati et al. 2016).

The interaction between storage location and storage time can reduce the percentage of moldy seeds and sprouts. The seeds stored in the Tamarenja and the seeds stored in the Kalukubula showed a significant difference, where the seeds stored in the Kalukubula produced a lower percentage of mold. This is presumably because the temperature in Kalukubula is higher than in Tamarenja (Pangastuti et al., 2019).

High temperatures will be followed by low humidity, where high temperatures will suppress mold growth. The suppression of fungal growth will significantly benefit the storage and germination process. This can be seen in the research results that show that storage in cauliflower produces a lower percentage of moldy seeds and sprouts compared to storage in Tamarenja (Pangastuti et al. 2019; Palupi et al. 2012).

The low temperature will be followed by high humidity, which can support the growth of fungi and bacteria. The results showed that storage in Tamarenja produced a higher percentage of moldy seeds and moldy sprouts than storage in Kalukubula. This is because the daily temperature in Tamarenja is lower than the daily temperature in Kalukubula (Amteme and Tefa 2018).

Indoor and outdoor storage in two different places did not make a significant difference because storage in each of these places had the same environmental conditions both indoors and outdoors (Lesilolo et al., 2012; Millati et al., 2016; Palupi et al., 2012; Sari and Faisal, 2017; Suryanto, 2013).

CONCLUSION

The best storage locations are in Kalukubula storage locations, both outdoors and indoors, with the highest germination capacity and potential for growth and faster germination times, a lower percentage of moldy seeds, and moldy sprouts. The best storage time is storage for two months, resulting in the highest germination and potential growth and faster germination times, the percentage of seeds, and moldy sprouts. The storage locations in indoor and outdoor Kalukubula and stored for two months were the best treatment with germination capacity (93.00% and 92.33%) and less mold percentage (1.69% and 1.46%).

REFERENCES

Amteme, K., Tefa, A. Identifikasi Cendawan Patogen pada Beberapa Varietas Benih Padi Sawah

Berdasarkan Model Penyimpanan. Savana Cendana 2018 3(1): 4–7.

Bettaieb, R.I., Bourgou, S., Ben Kaab, S., Aidi Wannes, W., Ksouri, R., Saidani Tounsi, M., Fauconnier, M.L. On the effect of initial drying techniques on essential oil composition, phenolic compound and antioxidant properties of anise (Pimpinella anisum L.) seeds. Journal of Food Measurement and Characterization. 2019 14: 220-228.

Bhatt, A., Bhat, N.R., Suleiman, M.K., Santo, A. Effects of storage, mucilage presence, photoperiod, thermoperiod and salinity on germination of Farsetia aegyptia Turra (Brassicaceae) seeds: implications for restoration and seed banks in Arabian Desert. Plant Biosyst. 2019 153, 280–287.

Dewi, T.K. Pengaruh Suhu Dan Lama Penyimpanan Terhadap Mutu Benih Jagung Manis (*Zea mays* Sachaarata Strurt) Di Pt. Sang Hyang Seri (Persero) Sukamandi, Jurnal Agrorektan. 2015 2(2): 117-124.

Fachruri, M., Muhidong, J., Agritechno, M.S.-J. Undefined, n.d. Analisis Pengaruh Suhu dan Kelembaban Ruang terhadap Kadar Air Benih Padi di Gudang Penyimpanan PT. Sang Hyang Seri (Persero). Jurnal Agritechno. 2019 12(2): 131-137

Sadjad, S Membangun Industri benih dalam era agribisnis Indonesia. PT. Gramedia, Jakarta.1997

Khalil, F. Desain Sistem Kendali untuk Pengering Gabah dengan Kolektor Surya dan Penyimpan Panas. Jurnal Keteknikan Pertanian. 2016 4(1): 87-96.

Kartahadimaja, J., Syuriani, E.E., Hakim, N.A. Pengaruh Penyimpanan Jangka Panjang (Long Term) terhadap Viabilitas dan Vigor Empat Galur Benih Inbred Jangung. Jurnal Penelitian Pertanian Terapan. 2013 13(3): 168-173.

Kibet, R.L., Too, E.J., Omari, A., Meso, M. Effects of Varying Storage Conditions on the Vigour of Fresh Seeds of Ekebergia capensis. AER J. 2019 3(2): 212-223.

Lesilolo, M.K., Patty, J., Tetty, N. Penggunaan Desikan Abu Dan Lama Simpan Terhadap Kualitas Benih Jagung (*Zea mays* L.) Pada Penyimpanan Ruang Terbuka. Agrologia. 2012 1(1): 51-59.

Millati, T., Akbar, A.R.M., Susi, S., Rahmi, A. Pengaruh Jenis Kemasan Terhadap Kondisi Penyimpanan Gabah Kering Panen, Rendemen Giling Dan Beras Kepala. ZIRAA’AH Maj. Ilm. Pertan. 2016 41(1): 103-112.

Novitasari, E., Ernawati, R. Uji Daya Tumbuh Benih Padi Lewat Masa Simpan. Pros. Semin. Nas. Pengemb. Teknol. Pertan. 2017 197-202. ISBN 978-602-70530- 0-7

Nugraha, S. Inovasi Teknologi Pascapanen Untuk Mengurangi Susut Hasil Dan Mempertahankan Mutu Gabah/Beras Di Tingkat Petani.Buletin Teknologi Pascananen Pertanian. 2012 8(1): 48-61.

Palupi, T., Ilyas, S., Machmud, M., Widajati, E. Pengaruh Formula Coating terhadap Viabilitas dan Vigor serta Daya Simpan Benih Padi (*Oryza sativa* L.).J. Agron Indonesia. 2012 40(1): 21-28.

Pangastuti, D., Setiawan, K., Pramono, E.,Sa’diyah, N. Pengaruh Suhu Ruang Dan Lama Penyimpanan Terhadap Vigor Benih Dan Kecambah Sorgum Varietas Super-2. J. Agrotek Tropika. 2019 7(3): 443-449.

Rachmat, R. Teknologi Penyimpanan Gabah Secara Hermetik untuk

Menekan Susut Kualitas dan Kuantitas. J. PANGAN 17, 2008 81–89. https://doi.org/10.33964 /JP.V17I2.256

Sari, W.,Faisal, M.F. Pengaruh Media Penyimpanan Benih Terhadap Viabilitas Dan Vigor Benih Padi Pandanwangi. Agroscience. 2017 7(2): 300-310.

Panggabean, T., Triana, A.N.,Hayati, A. Kinerja Pengeringan Gabah Menggunakan Alat Pengering Tipe Rak dengan Energi Surya, Biomassa, dan Kombinasi. AGRITECH. 2017 37(2): 229–235.

Suryanto, H. Pengaruh Beberapa Perlakuan Penyimpanan Terhadap Perkecambahan Benih Suren (*Toona sureni*). Jurnal Penelitian Kehutan Wallacea. 2013 2(1): 26-40.

Yuniarti, N., Syamsuwida, D., Aminah, A. Dampak Perubahan Fisiologi Dan Biokimia Benih Eboni (*Diospyros Celebica* Bakh.) Selama Penyimpanan. Jurnal Penelitian Hutan Tanaman. 2013 10(2): 65-71.