

## Documents

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**Effects of pre-anthesis drought stress on yield components and seed quality of rice (*Oryza sativa* L.)**  
(2018) *Malaysian Applied Biology*, 47 (5), pp. 149-155. Cited 8 times.

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**Abstract**

Sufficient supply of high quality planting materials is vital for a successful rice production. Pre-anthesis drought stress significantly reduces yield components of the lowland cultivated rice hence scientific information on its effect on seed quality is still very much lacking. This study was conducted to compare the effects of pre-anthesis drought stress on yield components and seed quality of two rice genotypes, a drought tolerant Moroberekan (V1), and local drought susceptible MR297 (V2). Three durations of drought stress used in this study were well-watered condition (S1), five days stress duration (S2), and ten days stress duration (S3). Complete (100%) spikelet sterility was observed for MR297 as compared with Moroberekan (31%) under S3. The seed germination rate of Moroberekan was significantly lower ( $p < 0.05$ ) under S1 (48%) as compared with S2 (80%) and S3 (70%). However, embryo of the non-germinated seeds of Moroberekan were still alive based on tetrazolium test thus indicated that the seeds were still viable yet dormant. In contrast, seed germination rate of MR297 was not affected by pre-anthesis drought stress (88% for S1 compared to 93% for S2). Therefore, seeds of MR297 produced under pre-anthesis drought stressed condition could be safely distributed in rice seeds supply chain. © 2019, Malaysian Society of Applied Biology. All rights reserved.

**Author Keywords**

Pre-anthesis drought stress; Rice; Seed quality; Yield components

**References**

- Abdul-Baki, A.A., Anderson, J.D.  
**Vigour determination in soybean seed by multiple criteria**  
(1973) *Crop Science*, 13, pp. 630-633.
- Aziz, A., Siti-Fairuz, M., Abdullah, M.Z., Ma, N.L., Marziah, M.  
**Fatty acid profile of salinity tolerant rice genotypes grown on saline soil**  
(2015) *Malaysian Applied Biology*, 44 (1), pp. 119-124.
- Carvalho, I.L., Meneghello, G.E., Tunes, L.M.D., Jácome, C.C., Soares, V.N.  
**Methodological adjustments to the tetrazolium test in rice seeds**  
(2017) *Journal of Seed Science*, 39, pp. 41-49.
- Chang, T.T., Tagumpay, O.  
**Inheritance of grain dormancy in relation to growth duration in 10 rice crosses**  
(1973) *SABRAO Newsletter*, 5, pp. 87-94.
- Cheah, B.H., Jadhao, S., Vasudevan, M., Wickneswari, R., Nadarajah, K.  
**Identification of functionally important microRNAs from rice inflorescence at heading stage of a qDTY4.1-QTL bearing Near Isogenic Line under drought conditions**  
(2017) *Plos ONE*, 12, pp. 1-24.
- Gu, X.Y., Chen, Z.X., Foley, M.E.  
**Inheritance of seed dormancy in weedy Rice**  
(2003) *Crop Science*, 43, pp. 835-843.

- Hampton, J.G., Boelt, B., Rolston, M.P., Chastain, T.G.  
**Effects of elevated CO<sub>2</sub> & temperature on seed quality**  
(2013) *Journal of Agricultural Science*, 151, pp. 154-162.
- Hayashi, M.  
**Relationship between endogenous germination inhibitors & dormancy in rice seeds**  
(1987) *Japan Agricultural Research Quarterly*, 21, pp. 153-161.
- (2005) *International Rules for Seed Testing 2005*,  
Switzerland: International Seed Testing Association (ISTA)
- Lin, S.Y., Sasaki, T., Yano, M.  
**Mapping quantitative trait loci controlling seed dormancy and heading date in rice, *Oryza sativa* L. Using backcross inbred lines**  
(1998) *Theoretical and Applied Genetics*, 96, pp. 997-1003.
- Liu, J.X., Bennett, J.  
**Reversible and irreversible drought-induced changes in the anther proteome of rice (*Oryza sativa* L.) genotypes IR64 and Moroberekan**  
(2011) *Molecular Plant*, 4, pp. 59-69.
- Liu, J.X., Liao, D.Q., Oane, R., Estenor, L., Yang, X.E., Li, Z.C., Bennett, J.  
**Genetic variation in the sensitivity of anther dehiscence to drought stress in rice**  
(2006) *Field Crops, Research*, 97, pp. 87-100.
- Maidin, K.H., Mohamad, C.K.I., Othman, S.K.  
**Impacts of natural disasters on the paddy production and its implications to the economy**  
(2015) *FFTC Agricultural Policy Articles*,  
Food and Fertilizer Technology Center, Taiwan
- (2008) *Sustainable Rice Planting Guide*,  
Malaysian Agricultural Research and Development Institute, Serdang, Selangor, Malaysia
- Martínez-Eixarch, M., Ellis, R.H.  
**Temporal sensitivities of rice seed development from spikelet fertility to viable mature seed to extreme temperature**  
(2015) *Crop Science*, 55, pp. 354-364.
- Nguyen, G.N., Sutton, B.G.  
**Water deficit reduced fertility of young microspores resulting in a decline of viable mature pollen and grain set in rice**  
(2009) *Journal of Agronomy and Crop Science*, 195, pp. 11-18.
- Patin, A.L., Gutormson, T.J.  
**Evaluating rice (*Oryza sativa* L.) seed vigor**  
(2005) *Seed Technology*, 27 (1), pp. 115-120.
- Puteh, A.B., Jali, N., Ismail, M.R., Juraimi, A.S., Samsuddin, N.  
**Pollen and seed yield components of water stressed cultivated and weedy rice**  
(2009) *Pertanika Journal of Tropical Agricultural Science*, 32, pp. 293-303.
- Puteh, A.B., Saragih, A.A., Ismail, M.R., Mondal, M.M.A.  
**Grain yield of cultivated and weedy rice to water stress at reproductive stage**  
(2013) *Journal of Food, Agriculture & Environment*, 11, pp. 742-746.
- Saragih, A.A., Puteh, A.B., Ismail, M.R., Mondal, M.M.A.  
**Pollen quality traits of cultivated (*Oryza sativa* L. ssp. indica) and weedy (*Oryza sativa* var. nivara) rice to water stress at reproductive stage**  
(2013) *Australian Journal of Crop Science*, 7, pp. 1106-1112.

- Se, C.H., Khor, B.H., Karupaiah, T.  
**Prospects in development of quality rice for human nutrition**  
(2015) *Malaysian Applied Biology*, 44 (2), pp. 1-31.
- Shamsudin, N.A.A., Swamy, B.P.M., Ratnam, W., Cruz, M.T.S., Sandhu, N., Raman, A.K., Kumar, A.  
**Pyramiding of drought yield QTLs into a high quality Malaysian rice cultivar MRQ74 improves yield under reproductive stage drought**  
(2016) *Rice*, 9, pp. 1-13.
- Shiratsuchi, H., Ohdaira, Y., Yamaguchi, H., Fukuda, A.  
**Breaking the dormancy of rice seeds with various dormancy levels using steam and high temperature treatments in a steam nursery cabinet**  
(2017) *Plant Production Science*, 20, pp. 183-192.
- Singh, R.P., Prasad, P.V.V., Reddy, K.R.  
**Impacts of changing climate and climate variability on seed production and seed industry**  
(2013) *Advances in Agronomy*, 118, pp. 49-110.
- Swamy, B.P.M., Shamsudin, N.A.A., Abd-Rahman, S.N., Mauleon, R., Ratnam, W., Cruz, M.T.S., Kumar, A.  
**Association mapping of yield and yield-related traits under reproductive stage drought stress in rice (*Oryza sativa* L.)**  
(2017) *Rice*, 12, pp. 1-13.
- Veasey, E.A., Karasawa, M.G., Santos, P.P., Rosa, M.S., Mamani, E., Oliveira, G.C.X.  
**Variation in the loss of seed dormancy during after-ripening of wild and cultivated rice species**  
(2004) *Annals of Botany*, 94, pp. 875-882.
- Vikram, P., Swamy, B., Dixit, S., Ahmed, H., Cruz, M.T.S., Singh, A., Kumar, A.  
**QDTY1.1, a major QTL for rice grain yield under reproductive-stage drought stress with a consistent effect in multiple elite genetic backgrounds**  
(2011) *BMC Genetics*, 12, p. 89.

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**Publisher:** Malaysian Society of Applied Biology

**ISSN:** 01268643

**Language of Original Document:** English

**Abbreviated Source Title:** Malays. Appl. Biol.  
2-s2.0-85059337782

**Document Type:** Article

**Publication Stage:** Final

**Source:** Scopus

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