

GERMINATION AND GROWTH CHARACTERISTICS OF *QUERCUS MYRSINIFOLIA* BLUME ACCORDING TO SEED WEIGHT, COLLECTION DATE, AND STORAGE CONDITIONS

Seong Hyeon Yong¹, Kwan Been Park², Do Hyeon Kim², Seung A Cha², Ji Hyun Lee², Seon A Kim², Jenna Jung², Dong Jin Park³, and Myung Suk Choi^{2,4*}

¹Division of Forest Biodiversity, Korea National Arboretum, Gwangneungsumogwon-ro 509, Pocheon, Republic of Korea

²Department of Forest environment Resource, Gyeongsang National University, Jinju-daero 501, Jinju, Republic of Korea, *E-mail: mschoi@gnu.ac.kr

³Department of Variety Examination, National Forest Seed and Variety Center, Suhoeri-ro 72, Chungju, Republic of Korea

⁴Institute of Agriculture of Life Science, Gyeongsang National University, Jinju-daero 501, Jinju, Republic of Korea

REFERENCES

- BONFIL C. (1998). The effects of seed weight, cotyledon reserves, and herbivory on seedling survival and growth in *Quercus rugosa* and *Q. laurina* (Fagaceae). *American Journal of Botany*, 85: 79-87.
- BONNER F. T. (1996). Responses to drying of recalcitrant seeds of *Quercus nigra* L. *Annals of Botany*, 78: 181-187.
- BROOKE J. M., BASINGER P. S., BIRCKHEAD J. L., LASHLEY M. A., MCCORD J. M., NANNEY J. S., HARPER C. A. (2019). Effects of fertilization and crown release on white oak (*Quercus alba*) mastings and acorn quality. *Forest Ecology and Management*, 433: 305-312.
- CHEN H., SHEN Y. (2023). Investigation of water distribution and mobility dynamics in recalcitrant *Quercus acutissima* seeds during desiccation using magnetic resonance methods. *Forests*, 14: Article 738.
- CHING T. M., RYND L. (1978). Developmental differences in embryos of high and low protein wheat seeds during germination. *Plant Physiology*, 62: 866-870.
- CHOI E. J., YONG S. H., PARK D. J., PARK K. B., KIM D. H., JIN E. J., CHOI M. S. (2022). Germination and growth characteristics of *Quercus myrsinifolia* Blume seedlings according to seed coat removal, type of potting soil and irrigation cycle. *Forests*, 13: Article 938.
- CLARK S. L., SCHLARBAUM S. E. (2018). Effects of acorn size and mass on seedling quality of northern red oak (*Quercus rubra*). *New Forests*, 49: 571-583.
- CUENA-LOMBRAÑA A., SANNA M., PORCEDDU M., BACCHETTA G. (2020). Does storage under gene bank conditions affect seed germination and seedling growth? The case of *Senecio morisii* (Asteraceae), a vascular plant exclusive to Sardinian water meadows. *Plants*, 9: Article 581.
- DOIJODE S. D. (2012). *Seed storage of horticultural crops*. CRC Press, Boca Raton, 339 pp.
- FERRINI F., BASSUK N. L. (2002). Propagation techniques of some ornamental oak species (*Quercus* spp.). *Advances in Horticultural Science*, 16: 38-42.
- FU X., XING S., XIONG H., MIN H., ZHU X., HE J., FENG J., MU H. (2018). Effects of packaging materials on storage quality of peanut kernels. *PLoS ONE*, 13: Article e0190377.
- GAROMA B., CHIBSA T., KENO T., DENBI Y. (2017). Effect of storage period on seed germination of different maize parental lines. *Journal of Natural Sciences Research*, 7: 8-14.
- GÓMEZ J. M. (2004). Bigger is not always better: conflicting selective pressures on seed size in *Quercus ilex*. *Evolution*, 58: 71-80.
- HONG T. D., ELLIS R. H. (1996). A protocol to determine seed storage behavior. *International Plant Genetics Resources Institute, Rome Italy*, 66 pp.
- IAKOVOGLOU V., MISRA M. K., HALL R. B., KNAPP A. D. (2007). The effect of seed size and parent tree on seed variables and seedling growth of *Quercus macrocarpa* and *Q. alba*. *Seed Science and Technology*, 35: 771-777.
- ISTA (2006). *International Seed Testing Association (ISTA), Handbook on Seedling Evaluation*. 2nd edition. Zurich, Switzerland, 49 pp.
- JEONG M. J., KIM N. Y., AN D. S., LEE D. S. (2010). Effect of Korean earthenware container (Onggi) on preservation of fresh fruits and vegetables. *Korean Journal of Packaging Science & Technology*, 16: 35-42.
- JO H. K., KILL S. H., PARK H. M., KIM J. Y. (2019). Carbon reduction by and quantitative models for landscape tree species in Southern Region for *Camellia japonica*, *Lagerstroemia indica*, and *Quercus myrsinaefolia*. *Journal of the Korean Institute of Landscape Architecture*, 47: 31-38.
- KANG Y. J., SONG K. M., SON S. K., KIM H. J., CHAE J. W., YOU H. C., CHOI H. S., PARK J. H. (2013). Research on establishing a foundation for cultivating promising warm zone resource trees. *NiFOS, Korea*, 497: 14-15.
- KELLY D. (1994). The evolutionary ecology of mast seeding. *Trends in Ecology & Evolution*, 9: 465-470.

- KOENIG W. D., KNOPS J. M. H. (1998). Scale of mast-seeding and tree-ring growth. *Nature*, 396: 225-226.
- KOENIG W. D., KNOPS J. M. H. (2000). Patterns of annual seed production by northern hemisphere trees: a global perspective. *The American Naturalist*, 155: 59-69.
- LEE B. J., CHOI Z. R., KIM S. Y., OH S. H., KIM J. H., HWANG W. H., AHN J. W., OH B. G., KU Y. C. (2008). An optimum harvest time for Chinese milk vetch (*Astragalus sinicus* L.) seed production. *Korean Journal of Crop Science*, 53: 70-74.
- QUERO J. L., VILLAR R., MARAÑÓN T., ZAMORA R. (2006). Interactions of drought and shade effects on seedlings of four *Quercus* species: physiological and structural leaf responses. *New Phytologist*, 170: 819-834.
- SEIWA K. (2000). Effects of seed size and emergence time on tree seedling establishment: importance of developmental constraints. *Oecologia*, 123: 208-215.
- SEO G. H., SONG B. S., AN D. S., CHUNG S. K., LEE D. S. (2006). Physical properties of Korean earthenware (Onggi) as food container. *Korean Journal of Packaging Science & Technology*, 12: 87-90.
- SHIN J. H., YOU Y. H. (2011). Effects of seed size on the rate of germination, early growth and winter survival in four oaks species. *Korean Journal of Environmental Biology*, 29: 274-279.
- SOH E. H., HEE W. M., PARK K. W., CHOI K. J., YOON M. K. (2014). Change of germination rate for chill pepper and Chinese cabbage seed in relation to packaging materials and storage conditions over 10 years. *Horticultural Science and Technology*, 32: 864-871.
- STEADMAN K. J., CRAWFORD A. D., GALLAGHER R. S. (2003). Dormancy release in *Lolium rigidum* seeds is a function of thermal after-ripening time and seed water content. *Functional Plant Biology*, 30: 345-352.
- SUGIYAMA A., MASUMORI M., TAKESHI T. (2016). Evaluating the bioactivity of recalcitrant seeds by vital staining after freezing in two temperate tree species, *Quercus myrsinifolia* and *Q. glauca*. *Bulletin of University of Tokyo. Forests*, 135: 1-14.
- TAK W. S., CHOI C. H., KIM T. S. (2006). Change in the seed characteristics and germination properties of *Ulmus davidiana* var. *japonica* according to seed collection time. *Journal of Korean Forestry Society*, 95: 316-322.
- TILKI F. (2010). Influence of acorn size and storage duration on moisture content, germination and survival of *Quercus petraea* (Mattuschka). *Journal of Environmental Biology*, 31: 325-328.
- TRUBAT R., CORTINA J., VILAGROSA A. (2010). Nursery fertilization affects seedling traits but not field performance in *Quercus suber* L. *Journal of Arid Environments*, 74: 491-497.
- WAWRZYNIAK M. K., MICHALAK M., CHMIELARZ P. (2020). Effect of different conditions of storage on seed viability and seedling growth of six European wild fruit woody plants. *Annals of Forest Science*, 77: 1-20.
- XIA K., DAWS M. I., HAY F. R., CHEN W. Y., ZHOU Z. K., PRITCHARD H. W. (2012a). A comparative study of desiccation responses of seeds of Asian Evergreen Oaks, *Quercus subgenus, Cyclobalanopsis* and *Quercus* subgenus *Quercus*. *South African Journal of Botany*, 78: 47-54.
- XIA K., DAWS M. I., STUPPY W., ZHOU Z. K., PRITCHARD H. W. (2012b). Rates of water loss and uptake in recalcitrant fruits of *Quercus* species are determined by pericarp anatomy. *PLoS ONE* 7 (10): Article e47368.
- ZHANG W. D., DONG G. J., SHU Q. Y., LI H. J., LIU G. S. (2005). Effect of storage conditions on seed germination, seedling growth and genetic stability in Chinese leymus (*Leymus chinensis*). *Seed Science and Technology*, 33: 431-440.