

PHOTOSENSITIVITY OF SEED GERMINATION OF *CYMBIDIUM DAYANUM* (ORCHIDACEAE)

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The study of the seed germination and the development *in vitro* of rare white-flowered form of *Cymbidium dayanum* was carried out. The seeds were germinated in conditions of darkness and light, at 20°C and with a transfer to 26°C in the 10th week of cultivation. Seed germination was successful at both 20°C and 26°C, however optimal temperature for development of the seedlings was 26°C. At 20°C in the light, seed germination began in the 20th week after sowing, whereas in the darkness in the 5th week. Thus, the light significantly increased the time before germination. In addition, the germination rate slowed down five weeks after the cultures transfer to 26°C and to the light, and by the end of the experiment, the percentage of germination was 80% compared with 94% in the dark. The results indicate a negative effect of light on the duration of germination suggesting its photosensitivity. The unusual type of germination was identified. The protocorm emergence took place from the chalazal end of the seed, instead of its middle part as in most orchids.

Keywords: *Cymbidium dayanum*, Orchidaceae, seed and seedling morphometry, seed germination, photosensitivity of seeds, protocorm development

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REFERENCES

- Andronova E.V., Kulikov P.V., Philippov E.G., Vasilyeva V.E., Batygina T.B. 2009. Problems and Perspectives of *in vitro* seed propagation in orchids of temperate zone. In: Embryology of flowering plants. Terminology and concepts. Vol. 3. Reproductive systems. Enfield USA, Plymouth UK. P. 367–375, 567.
- Arditti J. 1967. Factors affecting the germination of orchid seeds. – The Botanical Review. 33 (1): 1–97.
- Arditti J. 1982. Tropical orchids (epiphytic and terrestrial). In: Orchid Biology: Reviews and Perspectives. Vol II. Ithaca, London. P. 273–278.
- Averyanov L.V., Averyanova A.L., Nguyen K.S., Orlov N.L., Maisak T.V., Nguyen H.T. 2018. New and rare orchid species (Orchidaceae) in the flora of Cambodia and Laos. – Novitates Syst. Pl. Vasc. 49: 24–41. <https://doi.org/10.31111/novitates/2018.49.24>
- Chang C., Ying C.C., Yen H.F. 2005. Protocorm or rhizome? The morphology of seed germination in *Cymbidium dayanum* Reichb. – Bot. Bull. Acad. Sin. 46: 71–74.
- Cherevchenko T.M., Lavrentyeva A.N., Ivannikov R.V. 2008. Biotechnology of tropical and subtropical plants *in vitro*. Kyiv. 560 p. (In Russ.).
- De L.C. Varietal Wealth in Orchids. 2020. – Biotica Research Today. 2 (4): 40–46.
- Fast G. 1982. European Terrestrial Orchids (symbiotic and asymbiotic methods). – In: Orchid Biology: Reviews and Perspectives. Vol. II. Ithaca, London. P. 309–326.
- Hartini S., Wawangningrum H. 2019. Orchids from Mount Sago Nature Reserve, West Sumatera. – In: Proceedings SATREPS Conference. 1: 137–145.
- Harvais G. 1973. Growth requirements and development of *Cypripedium reginae* in axenic culture. – Can. J. Bot. 51 (2): 327–332.
- Johnson T.R., Kane M.E. 2012. Effects of temperature and light on germination and early seedling development of the pine pink orchid (*Bletia purpurea*). – Plant Species Biology. 27: 174–179. <https://doi.org/10.1111/j.1442-1984.2011.00347.x>
- Kauth P.J., Dutra D., Johnson T.R., Stewart S.L., Kane M.E., Vendrame W. 2008. Techniques and applications of *in vitro* orchid seed germination. – In: Floriculture, Ornamental and Plant Biotechnology. V. 375–391.
- Kolomeitseva G.L., Antipina V.A., Shirokov A.I., Khomutovskiy M.I., Babosha A.V., Riabchenko A.S. 2012. Orchid seeds: development, structure, germination. Moscow. 352 p. (In Russ.).
- Kumar S., Singh P.D., Devi H.S., Thongam B., Somkuwar B.G., Thorat S.S. 2018. *Cymbidium dayanum* and *Cymbidium sinense* (Orchidaceae): two new additions to the

- orchid wealth of Manipur, India. — *Richardiana*. 2: 82–87.
- Mahendran G., Muniappan V., Ashwini M., Muthukumar T., Bai V.N. 2013. Asymbiotic seed germination of *Cymbidium bicolor* Lindl. (Orchidaceae) and the influence of mycorrhizal fungus on seedling development. — *Acta physiologiae plantarum*. 35 (3): 829–840. <https://doi.org/10.1007/s11738-012-1127-3>
- Matsuda Y., Sugiura N. 2019. Specialized pollination by honeybees in *Cymbidium dayanum*, a fall–winter flowering orchid. — *Plant Species Biol.* 34 (1): 19–26. <https://doi.org/10.1111/1442-1984.12231>
- Matsui T., Kawai K., Samata Y. 1970. The effects of 'N-benzylaminopurine and α -naphthaleneacetic acid on organogenesis in *Cymbidium*. — *Bulletin of the Faculty of Agriculture. Tamagawa University*. 10: 99–106.
- Nahar S.J., Shimasaki K., Haque S.M. 2013. In vitro growth and development of *Cymbidium* orchid. — In: 11th Asia Pacific Orchid Conference. P. 171–176.
- Nikolaeva M.G., Lyanguzova I.V., Pozdova L.M. 1999. *Biologiya semyan* [The biology of seeds]. St. Petersburg. 231 p. (In Russ.)
- Nongdam P., Chongtham N. 2012. In vitro seed germination and mass propagation of *Cymbidium dayanum* Reichb.: An important ornamental orchid of North-East India. — *Trends in Horticultural Research*. 2 (2): 28–37. <https://doi.org/10.3923/thr.2012.28.37>
- Paek K.-Y., Murthy H.N. 2002. Temperate oriental *Cymbidium* species. *Orchid Biology: Reviews and Perspectives*. Vol. VIII. Dordrecht, Boston, London. P. 235–286.
- Pozdova L.M., Titova G.E., Butuzova O.G. 2008. Seed germination in *Fritillaria pallidiflora* (Liliaceae) under gibberellins and kinetin influence. — *Rastitelnye resursy*. 4: 30–42 (In Russ.).
- Prasad R.N., Mitra G.C. 1975. Nutrient requirements for germination of seeds and development of protocorms and seedlings of *Cymbidium* in aseptic cultures. — *Indian Journal of Experimental Biology*. 13 (2): 123–126.
- Pratt L.W., Bio K.F. 2012. New plant records from Hawaii Island. — *Bishop Museum Occasional Papers*. 113: 75–80.
- Pridgeon A.M., Cribb P.J., Chase M.W., Rasmussen F.N. 1999. *Genera Orchidacearum*. Vol. 1. Apostasioideae and Cypripedioideae. Oxford. 240 p.
- Rasmussen H.N. 1995. *Terrestrial orchids: from seed to mycotrophic plant*. Cambridge. 460 p.
- Rasmussen H.N., Dixon K.W., Jersáková J., Těšitelova T. 2015. Germination and seedling establishment in orchids: a complex of requirements. — *Annals of Botany*. 116: 391–402. <https://doi.org/10.1093/aob/mcv087>
- Tawaro S., Suraninpong P., Chanprame S. 2008. Germination and regeneration of *Cymbidium findlaysonianum* Lindl. on a medium supplemented with some organic sources. — *Walailak Journal of Science and Technology (WJST)*. 5 (2): 125–135.
- Veyret Y. 1965. Embryogénie compare et blastogénie chez les Orchidaceae. — *Monandreae*. Paris. P. 1–106.
- Veyret Y. 1974. Development of the embryo and the young seedling stages of orchids. — In: *The orchids scientific studies*. New York etc. P. 223–265.
- Vinogradova T.N., Andronova E.V. 2002. Development of orchid seeds and seedlings. — In: *Orchid biology: Reviews and Perspectives*. Vol. VIII. Dordrecht Boston, London. P. 167–234.
- Voges J.G., Rafael Fonseca Benevenuto R.F., Fritsche Y., Guerra M.P. 2014. Protocorm development of *Epidendrum fulgens* (Orchidaceae) in response to different saline formulations and culture conditions. — *Acta Scientiarum. Biological Sciences*. 36 (3): 287–292.
- Yuanhua L., Qingyun L., Rao M., Yeyuan C. 2008. Asymbiotic germination and low–temperature in vitro conservation of *Cymbidium dayanum*. — *Agricultural Science and Technology*. 36 (19): 8068–8069, 8119.
- Yakovlev M.S., Zhukova G.Ya. 1973. Angiosperms with green and colourless embryo (chloro- and leucoembryophytes). Leningrad. 101 p. (In Russ.).