

Abstract

The green freshwater alga *Haematococcus lacustris* is known as a natural source of a powerful antioxidant called astaxanthin. This secondary carotenoid is mainly formed in the thick-walled, resistant akinetes, thanks to which *H. lacustris* survives various unfavourable environmental conditions. In this study, we investigated the desiccation tolerance of akinetes. To monitor the physiological response of cells to stress, we used the method of measuring the effective quantum yield of photosystem II. First, we compared the desiccation tolerance of green and red akinetes at different desiccation rates. Both types of akinetes survived even the fastest desiccation at 10% relative humidity. By observing the ultrastructure of green and red akinetes using transmission electron microscopy, we found that the high resistance of akinetes is mainly due to the thick cell wall. In the following experiments, we examined the desiccation tolerance of red akinetes under extreme conditions in more detail. The akinetes survived desiccation for 12 weeks and short-term exposure to temperatures of -80 °C and 55 °C. In contrast, non-desiccated akinetes tolerated freezing better than exposure to high temperatures. Desiccation of akinetes may therefore serve as a means of survival on hot days. Our study has deepened our understanding of the desiccation tolerance of *H. lacustris* akinetes, which is probably crucial for the global distribution of this alga in shallow ephemeral pools.

Keywords: akinetes, astaxanthin, desiccation tolerance, effective quantum yield, *Haematococcus lacustris*, stress tolerance