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Analysis of the Ca2+ response of mycelial fungi to external effects by the recombinant aequorin method

Kozlova O., Egorov S., Kupriyanova-Ashina F., Rid N., El'-Registan G.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Using the mutant strain Aspergillus awamori 66A producing a recombinant Ca2+-dependent photosensitive protein aequorin, the dynamics of Ca2+ was studied for the first time in the cytosol of the micromycetes exposed to stressful factors, such as an increase in extracellular Ca2+ to 50 mM, hypoosmotic shock, and mechanical shock. Cell response to stress proved to involve an increase in the Ca2+ concentration in the cytosol, which was determined from the amplitude of aequorin luminescence and the time of the amplitude enhancement and relaxation. The level of Ca 2+ response depended on the physiological stimulus. Inhibitory analysis with various agents that block Ca2+ channels and with agonists that specifically enhance the activity of the channels suggested that (1) the level of Ca2+ in the cytosol of micromycetes increases in response to stress because of the ion influx from both the growth medium and intracellular reservoirs and (2) the potential-dependent transport systems play the major role in the Ca2+ influx into the cytosol of the micromycete cells.

Keywords

Aspergillus awamori, Ca 2+ dynamics, Mycelial fungi, Recombinant aequorin, Stress