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Generation of peptides by the model plant *Physcomitrella patens*

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Abstract

A systemic study of the peptidome, proteome and transcriptome of *Physcomitrella patens* moss was carried out. Three major forms of the plant, the mature leafy shoots (gametophores), the early filamentous form (protonemata) and the single cells (protoplasts) were homogenized, extracted by 1 M acetic acid/10% acetonitrile, the respective extracts subjected to fractionation and mass-spectral analysis under conditions minimizing instrument artefacts and post-mortem proteolysis. In protonemata and gametophores over 4000 peptides derived from 800 protein precursors were identified. About 1000 of them as well as 490 precursors are common to the two plant forms. Most of them belong to the photosynthetic system. Preparation of protoplasts from the moss protonemata is accompanied by massive degradation of proteins, resulting in over 20 thousand of peptides appearing as fragments of 1500 protein precursors. Participation of the precursor in generation of peptides correlates with the level of its expression. The remarkable intensity of peptide generation in protoplasts is considered as a molecular expression of the cell stress induced by cell wall removal, followed by distortion of cell shape. Proteolytic mechanisms leading to the observed sets of peptides will be discussed. Physiological significance of peptide pools discovered in this study requires further study. A novel test system was developed for that purpose, based on measurement of spore germination in the presence of tested compound. Several of the identified peptides were synthesized by solid phase technique, subjected to the above test and showed significant activity.

Biography

Born on September 18, 1937. Graduated from the Chemistry Department of Moscow State University (1960). In 1988 was elected as a Member of the Russian Academy of Sciences (RAS), in 1989 - as Director of Shemyakin@Ovchinnikov Institute of Bioorganic Chemistry. Author of over 400 publications on synthesis, structure and function of biologically active peptides - antibiotics, toxins, hormones, vaccines. At present the main research effort is directed at peptidomic research, i.e. structural analysis of peptide pools present in living cells, tissues and organisms followed by elucidation of their function. Awardee of the Great Lomonosov medal of RAS “For Outstanding Contributions to Bioorganic Chemistry”.