



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI  
SHORT ABSTRACT OF THESIS

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Programme of Study : Ph.D.

Thesis Title: Studies on calcium signaling genes *phospholipase C-1*, *secretory phospholipase A2*, and *calcium proton exchanger-1* in *Neurospora crassa*

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SHORT ABSTRACT

The universal second messenger  $\text{Ca}^{2+}$  plays a central role in intracellular signaling in eukaryotes. *Neurospora crassa* is a naturally occurring filamentous fungus extensively used as a model organism to understand different aspects of biological processes including the  $\text{Ca}^{2+}$  signaling machinery. However, only a few  $\text{Ca}^{2+}$  signaling genes have been studied so far in *N. crassa* and detailed knowledge about its  $\text{Ca}^{2+}$  signaling components has remained largely unknown. Therefore, in my Ph.D thesis work, I have studied the cellular roles of three important  $\text{Ca}^{2+}$  signaling genes *phospholipase C-1* (*plc-1*), *secretory phospholipase A2* (*sPLA2*), and *calcium proton exchanger-1* (*cpe-1*) in *N. crassa*. I found that the *plc-1*, *sPLA2*, and *cpe-1* genes are involved in the regulation of  $[\text{Ca}^{2+}]_c$ , carotenoid accumulation, survival under stress conditions, and acquisition of induced thermotolerance in *N. crassa*. Studies on the double mutants of *plc-1*, *sPLA2*, and *cpe-1* revealed that they synthetically regulate growth, aerial hyphae, biomass accumulation, conidial germination, carotenoid accumulation, fertility,  $\text{Ca}^{2+}$  stress tolerance, UV survival, oxidative stress survival, and acquisition of thermotolerance induced by heat shock. I have shown that the signaling functions of the *plc-1*, *sPLA2*, and *cpe-1* genes are independent of cAMP mechanism. Important developmental and biosynthetic genes were shown to regulate the conidiation, carotenoid accumulation, and pheromone signaling of the *plc-1*, *sPLA2*, and *cpe-1* genes. I hypothesized a possible mechanistic model for the  $\text{Ca}^{2+}$  signaling responses mediated by the *plc-1*, *sPLA2*, and *cpe-1* genes. The *plc-1*, *sPLA2*, and *cpe-1* act in co-ordination for regulating  $[\text{Ca}^{2+}]_c$  which further promotes *N. crassa* growth and development.