

Abstract

The eukaryotic cell cycle is well understood mainly in yeasts and animals. Basic regulatory mechanisms, with cyclin-dependent kinases (CDKs) playing crucial roles, are similar in all eukaryotes including plants. CDKs operate mainly at the key cell cycle checkpoints, G1/S and G2/M. Phosphorylation and dephosphorylation of CDKs by kinases and phosphatases have both negative and positive effect. Negative regulator at the G2/M transition is WEE1 kinase which phosphorylates conserved amino acid residues T14 and Y15 of CDK. Phosphatase CDC25 removes this inhibitory phosphate in yeasts and animals and forces cells into mitosis. Plant cell cycle exhibits remarkable differences. Importantly, it is controlled by phytohormones, and some key points of regulation remain obscure - a functional plant homologue of yeast CDC25 phosphatase has not been found in plants yet though Y15 inhibitory phosphorylation by WEE1 kinase blocks mitosis entry in plants as well. Thus, the regulatory mechanism of G2/M transition in plant cells is still to be found.

Phytohormones play a key role, not only in the plant cell cycle, but in whole plant development. Interplay between the two groups of phytohormones: auxins and cytokinins, is crucial. Especially cytokinins significantly influence the regulation of G2/M checkpoint. It is proposed that cytokinins activate CDC25-like or another plant phosphatase in order to enable transition to mitosis.

This thesis focuses on cytokinins and their specific role in the cell division, especially regulation of G2/M transition of the plant cell cycle.