

# The role of chitinases and glucanases in somatic embryogenesis of black pine and hybrid firs

## Research Article

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**Abstract:** Glucanase and chitinase enzymes play an important role in different plant processes including defense against pathogens and morphogenesis. Moreover, their role in the processes of somatic embryogenesis has been demonstrated. It has been suggested, that the presence of this type of proteins might be a marker for embryogenic potential of callus cultures. In this work we screened for the presence of glucanases and chitinases in liquid growth media of a set of conifer embryogenic cell lines in order to find correlation with their embryogenic potential. We have found that none of the 12 chitinase isoforms detected in culture media of *Pinus nigra* Arn. or the nine chitinases detected in media with *Abies alba* x *A. cephalonica* and *Abies alba* x *A. numidica* embryogenic tissues could be linked to their embryogenic capacity. Similarly, none of the six glucanase isoforms detected in the extracellular fluid of *Pinus nigra* Arn. cultures can be assigned as a marker of embryogenic potential. Thus, our data indicate the large variability and doubtless importance of glucanases and chitinases for cell growth and development of somatic embryos, however, do not support the premise that they are markers of embryogenesis.

**Keywords:** *Abies alba* x *A. cephalonica* • *A. alba* x *A. numidica* • Embryogenic potential • Liquid culture • *Pinus nigra* • PR proteins

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## 1. Introduction

Extracellular proteins belong to the compounds that participate in the regulation of embryogenesis and originate mostly from cell walls of cultivated plant explants. Chitinases, glucanases [1], peroxidases [2], lipid transferases [3], and arabinogalactan proteins [4] are the most studied extracellular proteins. Chitinases, glucanases and peroxidases are pathogenesis related (PR) proteins, which play an important role in plants against different stress factors and pathogens.

Chitinases are polyglycanhydrolases, which catalyse the hydrolysis of chitin, the main component of the fungal cell wall and the outer skeleton of insects and

some sea animals [5]. In normal conditions, chitinases are expressed in low levels in some organs during specific developmental phases, suggesting that some may participate in the processes of development and growth [6-8]. Expression of many chitinases is induced by biotic [9,10] and abiotic stimuli [11]. Therefore, their function in defense mechanisms is well known and documented [12-14].

Many experimental results have proven that extracellular chitinases and glucanases play an important role in the development of gymnosperm [15-19] and angiosperm somatic embryos [20-25]. The regulatory function of chitinases in the process of somatic embryogenesis consists of the ability to

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