学 位 論 文 要 旨
Dissertation Abstract

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学位論文題目：
Title of Dissertation

Studies on expression of *PsAPY1* in early stages of development in pea (*Pisum sativum* L. var. Alaska)
エンドウ(*Pisum sativum* L. var. Alaska)の初期成長段階における*PsAPY1*の発現に関する研究

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Nucleoside triphosphate diphosphohydrolases (NTPDases; apyrases; EC 3.6.1.5) hydrolyze di- and tri-phosphate nucleotides without forming the intermideate diphosphate, into nucleotide monophosphates. It doesn't hydrolyze the monophosphate nucleotides. In the present study, the spatio-temporal expression of an apyrase gene (*PsAPY1*) from pea (*Pisum sativum* L. var. Alaska) was investigated during the early stages of germination [10 h after imbibition and 16, 35, 62, and 84 h after sowing (HAS)] and during apical hook formation [45, 60 and 78 HAS]. At 10 h after imbibition, the *PsAPY1* transcript was visible in traces throughout the hydrated shoot and root tissues of the embryo and became higher by 16 HAS in the tunica layer of the shoot apical meristem (SAM), epidermis, vascular bundle, and root tip. At 35 HAS, expression signals became stronger and more widely distributed in the corpus tissues of the growing SAM and in the root; the highest expression was detected in the epidermis, differentiating vascular bundle, and little in cortex tissues. By 62 HAS, the expression of *PsAPY1* was strongest and extensively distributed in the above mentioned regions. At this time, higher expression was also detected in the zones of epicotyl differentiating into plumule and hook. Since differentiation is one of the most important aspects of growth, we further examined the expression of *PsAPY1* in detail, during the formation and differentiation of apical hook. We found that *PsAPY1* was extensively distributed in the epidermis of growing apical hook during the formation stage at 45 HAS, when the hook has not completely emerged from the seed coat. The expression signals further increased in the

fully formed apical hook at 60 HAS. Here, higher transcript accumulation was also detected in the tissues of vascular bundles and cortex. However, at 78 HAS, the curvature of the hook was reduced and hook was in the process of opening. At this time, expression of *PsAPY1* was visible in all the above mentioned tissues although the level of expression was slightly lower than at the previous stage (60 HAS). Another physiologically important aspect of growth is organogenesis. So, we also examined the expression of *PsAPY1* during lateral root formation and found that *PsAPY1* was highly expressed in the tissues of growing lateral root primordia. However, at 84 HAS, the transcript accumulation declined in the shoot and root tissues. Growth and development of seedlings are the physiologically most important stages in the life cycle of plants. The presence of *PsAPY1* during these important stages i.e., germination, differentiation, and organogenesis indicates its essential role in the early developmental stages of plants.

Apyrases in plants have been found to be associated with numerous important functions like auxin transport, stomatal regulation, root nodule formation, lateral root development, phosphate uptake, pollen germination and growth etc. The present study here sheds light into the probable roles apyrase could have in germination, cell division, lateral root development and hook formation of plants. By investigating the probable role of apyrase in the development of edible parts of plants, it may be possible to develop superior crops with higher yield and tolerance to biotic and abiotic stresses which can ultimately improve agricultural productivity. Thus, the expression analysis of apyrase gene in pea could form a basic study that could provide the basis for advanced and applied future studies needed for crop improvement.

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