

DEVELOPMENTAL REGULATION OF GA BIOSYNTHESIS DURING GERMINATION AND EARLY SEEDLING GROWTH OF PEA

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The gene expression patterns of a family of gibberellin (GA) biosynthesis genes was examined in order to gain insight into how these genes coordinate GA biosynthesis during germination and early post-germination stages of the large-seeded dicotyledonous plant, pea (*Pisum sativum* L.). Five genes (*GA20ox1*, *GA20ox2*, *GA3ox1*, *GA2ox1* and *GA2ox2*) encode five regulatory GA biosynthesis enzymes (two GA 20-oxidases, a GA 3 β -hydroxylase and two GA 2 β -hydroxylases) in pea. These were profiled and then correlated with endogenous GA levels, which were quantified by the isotope dilution method. At the time the developing embryo fills the seed coat, high mRNA levels of *PsGA20ox2* (primarily responsible for conversion of C20-GAs to GA₂₀), *PsGA2ox1* (primarily responsible for conversion of GA₂₀ to GA₂₉) and *PsGA2ox2* (primarily responsible for conversion of GA₁ to GA₈) were detected in the seeds, along with high GA₂₀ and GA₂₉ levels, enzymatic products of these genes. Maturation of the embryo was accompanied by a large reduction in mRNA levels of *PsGA20ox2* and *PsGA2ox1* but not *PsGA2ox2*. This pattern is consistent with the lower levels of GA₂₀ and GA₂₉ detected in the embryo at maturity. Following imbibition, the level of GA₂₀ in the cotyledons decreased while the expression of *PsGA3ox1* and the levels of GA₁ increased, implying that GA₂₀ was used for *de novo* synthesis of GA₁ in the imbibed cotyledons. As the imbibing embryo axis doubled in size, mRNA levels of *PsGA20ox1* and *PsGA3ox1* in the embryo axis had increased markedly. In contrast, *PsGA2ox2* mRNA levels had decreased and *PsGA2ox1* levels remained low in the imbibed embryo axes. Coincidentally, both GA₁ and GA₈ were detectable in the embryo axes at this time. Subsequent, root and shoot specific expression of these GA biosynthesis genes and endogenous GA₂₀, GA₁, and GA₈ in the rapidly developing seedlings support a key role for *de novo* GA biosynthesis in early, post-germination growth phases of the pea seedling.

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