Molecular dynamics of a halogenated auxin in pea pod growth

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ABSTRACT

In the history of life on Earth, the evolution of flowering plants (angiosperms) is arguably one of the most impactful events that has shaped the world of today. More than 95% of extant plants belong to the angiosperm phylum and domesticated flowering plants are essential sources of protein and energy in food consumed by humans. A major reason for the success of angiosperms is the formation of carpels in the centre of the flowers that develop as fruits after pollination harbouring the seeds for the next generation.

Pea (*Pisum sativum* L) is a crop plant species with an extensive history in genetics research, and a useful model for legume crops in general. In contrast to the model plant *Arabidopsis thaliana*, which produces bicarpellate (two-chambered) fruit with many small seeds, pea produces monocarpellate (single-chambered) fruit (or pods) with comparatively larger but fewer seeds. Deciphering the seed/pod molecular conversation that regulates pea reproductive development may therefore lead to the discovery of alternative signalling systems. Moreover, given the important role of legume crops in the provision of plant-based protein and in achieving low-input agriculture, the improvement of legume crops has wide environmental implications.

Auxin is a versatile hormone functioning in practically all aspects of plant development, including fruit formation. Pea (along with other species in the Fabeae and Trifolieae (F/T) tribes of the legume family) produces a chlorinated variant of auxin, 4-Cl-IAA, which is enriched in fruit and seed. In fact, 4-Cl-IAA promotes pod growth following fertilisation whereas IAA does not suggesting that 4-Cl-IAA provides a mobile seed-to-pod signal. Here, our latest research into biosynthesis, transport and signalling of this auxin variant will be presented.