

How did flowering plants evolve to dominate Earth?

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To Charles Darwin it was an 'abominable mystery' and it is a question which has continued to vex evolutionists to this day: when did flowering plants evolve and how did they come to dominate plant life on earth? Today a study in *Ecology Letters* reveals the evolutionary trigger which led to early flowering plants gaining a major competitive advantage over rival species, leading to their subsequent boom and abundance.

The study, by Dr Tim Brodribb and Dr Taylor Field of the University of Tasmania and University of Tennessee, used plant physiology to reveal how <u>flowering plants</u>, including crops, were able to dominate land by evolving more efficient hydraulics, or 'leaf plumbing', to increase rates of <u>photosynthesis</u>.

"Flowering plants are the most abundant and ecologically successful group of plants on earth," said Brodribb. "One reason for this dominance is the relatively high photosynthetic capacity of their leaves, but when and how this increased photosynthetic capacity evolved has been a mystery."

Using measurements of leaf vein density and a linked hydraulicphotosynthesis model, Brodribb and Field reconstructed the evolution of leaf hydraulic capacity in seed plants. Their results revealed that an evolutionary transformation in the plumbing of angiosperm leaves pushed photosynthetic capacity to new heights.

The reason for the success of this evolutionary step is that under



relatively low atmospheric C02 conditions, like those existing at present, water transport efficiency and photosynthetic performance are tightly linked. Therefore adaptations that increase water transport will enhance maximum photosynthesis, exerting substantial evolutionary leverage over competing species.

The evolution of dense leaf venation in flowering plants, around 140-100 million years ago, was an event with profound significance for the continued evolution of flowering plants. This step provided a 'cretaceous productivity stimulus package' which reverberated across the biosphere and led to these plants playing the fundamental role in the biological and atmospheric functions of the earth.

"Without this hydraulic system we predict leaf photosynthesis would be two-fold lower then present," concludes Brodribb. "So it is significant to note that without this evolutionary step land plants would not have the physical capacity to drive the high productivity that underpins modern terrestrial biology and human civilisation."

Source: Wiley (<u>news</u> : <u>web</u>)

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