Flowers' rapid growth rate can be traced back 65 million years

May 10 2011

Researchers have discovered that an evolutionary change from 65 million years ago may have set the pace for the rapid growth rate of present-day flowering plants.

Taylor Feild, associate professor of ecology and evolutionary biology at the University of Tennessee, Knoxville, in collaboration with a group of other researchers from around the world, have determined the precise dates that angiosperms, or flowering plants, experienced two surges in growth during the Cretaceous period.

Their findings are published in the current edition of the Proceedings of the National Academy of Sciences.

The researchers measured the vein densities, or number and length of veins in a given area, in the fossils of more than 300 angiosperm leaves and then compared them to the fossils of nonangiosperms that lived at the same time.

"Because leaf veins supply the water necessary for how plants 'eat' the air to obtain carbon dioxide that is necessary for growth and reproduction, the discovery of shift toward densely veined leaves during the latest Cretaceous strongly suggests that modern functioning vegetation first appeared during that time," Feild said.

The results also provide additional evidence that modern tropical rainforests appear to be no older than the latest Cretaceous.

More information: Fossil evidence for Cretaceous escalation in angiosperm leaf vein evolution, *PNAS*, Published online before print May 2, 2011, doi: 10.1073/pnas.1014456108

Abstract
The flowering plants that dominate modern vegetation possess leaf gas exchange potentials that far exceed those of all other living or extinct plants. The great divide in maximal ability to exchange CO2 for water between leaves of nonangiosperms and angiosperms forms the mechanistic foundation for speculation about how angiosperms drove sweeping ecological and biogeochemical change during the Cretaceous. However, there is no empirical evidence that angiosperms evolved highly photosynthetically active leaves during the Cretaceous. Using vein density (DV) measurements of fossil angiosperm leaves, we show that the leaf hydraulic capacities of angiosperms escalated several-fold during the Cretaceous. During the first 30 million years of angiosperm leaf evolution, angiosperm leaves exhibited uniformly low vein DV that overlapped the DV range of dominant Early Cretaceous ferns and gymnosperms. Fossil angiosperm vein densities reveal a subsequent biphasic increase in DV. During the first mid-Cretaceous surge, angiosperm DV first surpassed the upper bound of DV limits for nonangiosperms. However, the upper limits of DV typical of modern megathermal rainforest trees first appear during a second wave of increased DV during the Cretaceous-Tertiary transition. Thus, our findings provide fossil evidence for the hypothesis that significant ecosystem change brought about by angiosperms lagged behind the Early Cretaceous taxonomic diversification of angiosperms.

Provided by University of Tennessee at Knoxville

23 June 2024 from https://phys.org/news/2011-05-rapid-growth-million-years.html