

Climatic gradient and $\delta^{13}\text{C}$ values of plants: A case study from the Himalaya

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Change in atmospheric conditions is believed to be responsible for the evolution of plants. In an evolving atmosphere, gymnosperms appeared during the Carboniferous Period and appearance and diversification of angiosperms occurred during the Cretaceous time. In a symbiotic environment, difference in the response of these plant types to the climatic factors can be studied for parallel correlation. To monitor plants response with the changing climatic factors, variations in plants $\delta^{13}\text{C}_{\text{leaf}}$ value can be used as one of the indicators. To investigate the variation in $\delta^{13}\text{C}_{\text{leaf}}$ values in response to water availability, air temperature and a change in $p\text{CO}_2$ pressure with elevation, five gymnosperm (*Cedrus deodara*, *Pinus wallichiana*, *Pinus roxburghii*, *Pinus gerardiana* and *Abies pindrow*) and two angiosperm (*Betula utilis* and *Eucalyptus globulus*) species were collected along an altitude gradient in the Himalayan mountain ranges. The studied sites cover ca. 3.5 km elevation transect. The $\delta^{13}\text{C}_{\text{leaf}}$ value for *Cedrus Deodara* changes with altitude and mean annual precipitation (MAP). A sensitivity of 2.9‰ km^{-1} and $0.3\text{‰}/100\text{ mm}$ was calculated for the altitude range of 1.5 km and precipitation range of 700 mm respectively. Although *Pinus wallichiana* do not show a correlation between elevation and $\delta^{13}\text{C}_{\text{leaf}}$ value, a negative correlation between MAP and $\delta^{13}\text{C}_{\text{leaf}}$ value with an average sensitivity of $0.2\text{‰}/100\text{ mm}$ for the precipitation range of 900 mm is obtained. Comparison of results acquired from both gymnosperm and angiosperm species shows that gymnosperms are comparatively more sensitive to the climatic factors than angiosperms growing in a similar environmental setting.