Researchers investigate impact of elevated CO_2 concentration on subtropical trees

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Ailaoshan subtropical forest. Credit: XTBG

The atmospheric carbon dioxide (CO_2) concentration has been continuously increasing since the industrial revolution, and the increase in CO_2 concentration will have an important impact on the physiological

function and growth of plants. However, few studies have focused on how the hydraulic structure and growth of plants in subtropical zones respond to elevated CO_2 concentrations.

In a study published in *Agricultural and Forest Meteorology*, researchers from the Xishuangbanna Tropical Botanical Garden (XTBG) of the Chinese Academy of Sciences and their collaborators investigated the effects of elevated CO_2 concentration on leaf gas exchange, nitrogen and phosphorus concentrations, leaf and stem hydraulic conductivity, and seedling growth of four evergreen and four deciduous tree seedlings in the Ailaoshan subtropical forest in Yunnan.

The researchers conducted a well-watered potted seedling experiment by using the CO_2 artificial climate chambers with an internal area of 14 m^2 and a height of 2.6 m at the Ailaoshan Ecological Station of XTBG.

After one year of treatment, they measured the leaf gas exchange, leaf nitrogen and phosphorus concentrations, leaf hydraulic conductance, and stem hydraulics of the four evergreen and four deciduous species.

It was found that elevated CO_2 concentration caused an increase in the photosynthetic rate per unit leaf area and a decrease in stomatal conductance in both evergreen and deciduous plants, while the enhancing effect on the photosynthetic capacity per unit leaf dry weight of evergreen plants was stronger than that of deciduous plants.

The biomass of both evergreen and deciduous plants increased with increasing CO_2 concentration, with greater variation among evergreen plant species.

Compared to evergreen plants, the leaf specific conductance of deciduous plants was more promoted by increasing CO_2 concentration, and changes in leaf specific conductance under conditions of elevated

CO_2 concentration were mainly influenced by biomass.

Increased CO_2 concentration promoted the synergistic relationship between branch water transport capacity and leaf gas exchange, phosphorus content, and biomass.

"Our study can help to predict changes in tree physiological traits, growth, and community succession in subtropical forests in the context of climate change," said Fan Zexin of XTBG.

More information: Pei-Li Fu et al, The impact of elevated CO2 concentration on photosynthesis, growth and hydraulics of evergreen and deciduous tree seedlings from a subtropical forest in Southwest China, *Agricultural and Forest Meteorology* (2024). DOI: 10.1016/j.agrformet.2024.110021

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