**Title**:

**Influence of Temperature and Precipitation on Phytolith-Occluded Carbon (PhytOC) Accumulation in *Bambusa emeiensis* in Wuhan, China**

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**Abstract**:

Climate change mitigation increasingly relies on enhancing terrestrial carbon sinks. Among these, phytolith-occluded carbon (PhytOC) offers a uniquely stable, long-term carbon storage mechanism. This study investigates the influence of temperature and precipitation on PhytOC accumulation in leaves of the sympodial bamboo *Bambusa emeiensis* over a three-year period (2022–2024) in Wuhan, central China. Leaf samples were collected every 10 days, with phytoliths extracted via microwave digestion and analyzed by alkaline spectrophotometry. Results revealed a consistent seasonal pattern: PhytOC accumulation increased from winter to summer, peaking between July and August (up to 59 $g \cdot kg^{-1}$), and declined towards autumn. Strong positive correlations existed between temperature and PhytOC at both 10-day and monthly scales ($r = 0.72–0.93$, $p < 0.05$), supported by statistically significant ANOVA tests. Precipitation, in contrast, exhibited a weaker and inconsistent relationship with PhytOC, acting primarily as a modulating rather than a primary factor. However, an extreme drought event in 2022 caused a 28.8% decline in PhytOC accumulation during peak summer months despite high temperatures. These findings demonstrate that temperature is the primary driver of PhytOC accumulation in *B. emeiensis*, with precipitation playing a secondary, scale-dependent role. The results highlight the significant climate-responsive

carbon storage potential of sympodial bamboo forests and support the promotion of *B. emeiensis* in forest-based carbon management and nature-based climate solutions.

**Keywords**: Phytolith-occluded carbon (PhytOC); *Bambusa emeiensis*; temperature; extreme drought.

**Biography**:

Amjad Ali completed his PhD at China University of Geosciences, Wuhan, focusing on environmental studies and carbon sequestration in bamboo species. His research interests include the role of plants in climate change mitigation, particularly through carbon storage mechanisms like phytolith-occluded carbon (PhytOC).

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