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# Atmospheric composition as a potential taphonomic filter for the fossil leaf record

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Controlled environment chambers provide a unique opportunity to investigate plant responses to simulated palaeoatmospheric compositions that reflect previous periods of Earth history. One potentially important role of atmospheric composition that has not been considered in detail, is how it may affect plant preservation in the fossil record. Previous work has shown that plants, particularly angiosperms, have a tendency to increase leaf mass per area (LMA) when grown in above-ambient $CO_2$. We tested the response of six nearest living equivalent taxa for Mesozoic floras to a range of simulated Mesozoic palaeoatmospheric treatments in controlled environment chambers. Exposure to high $CO_2$ ($\sim$1,500 ppm) led to a statistically significant ($p < 0.001$) increase in LMA in four out of 6 species and exposure to high $CO_2$ and low $O_2$ ($\sim$13%) led to a statistically significant ($p < 0.001$) increase in LMA in all six species. These findings suggest that atmospheric composition has a highly significant impact on LMA. If this is also the case in fossil floras, then this suggests that atmospheric composition may influence leaf preservation potential in the fossil record. Based on these results, we put forward the hypothesis that atmospheric composition is an important taphonomic filter of the fossil leaf record. Further research is now required to test the significance of atmospheric composition versus other well-known taphonomic filters.