Relative contribution of UV radiation to litter breakdown in Australian grasslands

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Abstract

1. Grassy ecosystems cover ˜40% of the global land surface and are an integral component of the global carbon cycle. Grass litter decomposes via a combination of ultraviolet radiation degradation (which returns carbon to the atmosphere rapidly) and biological decomposition (a slower carbon pathway). As such, decomposition and carbon storage in grasslands may vary with climate and exposure to solar radiation. We investigated rates of grass litter decomposition in Australian temperate grasslands along a climate gradient to uncouple the relative importance of UV radiation and climate on decomposition. 2. Litterbags containing two common native grass species were deployed at six grassland sites across a precipitation gradient (380-890 mm) in south-eastern Australia. Bags were retrieved over 39 weeks to measure mass loss from decomposition. We used shade treatments to partition UV degradation from biological decomposition. 3. The shade treatment consistently reduced the rate of decomposition relative to full-sun treatments at all sites; there was no significant difference in the effect size of the shade treatment among sites. The rate of decomposition was positively correlated with rainfall midway through the experiment, but there were no significant differences in total decomposition among sites after 39 weeks. In general, the shape of decomposition curves was more linear than has typically been observed in global decomposition studies. 4. Synthesis: We found that UV exposure was a strong contributor to litter decomposition in temperate Australian grasslands. This effect was not influenced by climatic variables and may be related to a period of photopriming prior to further biotic decomposition. This study highlights the importance of litter composition and UV exposure in our understanding of how decomposition patterns contribute to global carbon cycling.

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