Leaf surface wax is a source of plant methane formation under UV radiation and in the presence of oxygen - DTU Orbit (29/11/2018)

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The terrestrial vegetation is a source of UV radiation-induced aerobic methane (CH$_4$) release to the atmosphere. Hitherto pectin, a plant structural component, has been considered as the most likely precursor for this CH$_4$ release. However, most of the leaf pectin is situated below the surface wax layer, and UV transmittance of the cuticle differs among plant species. In some species, the cuticle effectively absorbs and/or reflects UV radiation. Thus, pectin may not necessarily contribute substantially to the UV radiation-induced CH$_4$ emission measured at surface level in all species. Here, we investigated the potential of the leaf surface wax itself as a source of UV radiation-induced leaf aerobic CH$_4$ formation. Isolated leaf surface wax emitted CH$_4$ at substantial rates in response to UV radiation. This discovery has implications for how the phenomenon should be scaled to global levels. In relation to this, we demonstrated that the UV radiation-induced CH$_4$ emission is independent of leaf area index above unity. Further, we observed that the presence of O$_2$ in the atmosphere was necessary for achieving the highest rates of CH$_4$ emission. Methane formation from leaf surface wax is supposedly a two-step process initiated by a photolytic rearrangement reaction of the major component followed by an α-cleavage of the generated ketone.
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