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Deciphering Specific Host-Selective Toxin Interaction of Cassiicolin with Lipid Membranes and its Cytotoxicity on Rubber Leaves

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Abstract : Cassiicolin (Cas), a toxin produced by Corynespora cassiicola, is responsible for corynespora leaf fall (CLF) disease in rubber trees. Currently, the molecular mechanism of the cytotoxicity of Cas isoforms (i.e., Cas1, Cas2) on rubber leaves and its host selectivity have not been fully elucidated. This study analyzed the binding of Cas1 and Cas2 to membranes consisting of different plant lipids and their membrane-disruption activities. Using high-speed atomic force microscopy and confocal microscopy, this study reveals that the binding and disruption activities of Cas1 and Cas2 on lipid membranes are strongly dependent on the specific plant lipids. The negative phospholipids, glycerolipids, and sterols are more susceptible to membrane damage caused by Cas1 and Cas2 than neutral phospholipids and betaine lipids. In summary, This study unveils that (i) Cas1 and Cas2 directly damage and cause necrosis in the leaves of specific rubber clones; (ii) Cas1 and Cas2 can form biofilm-like structures on specific lipid membranes (negative phospholipids, glycerolipids, and sterols). The biofilm-like formation of Cas toxin plays an important role in selective disruption on lipid membranes; (iii) Vulnerability of the specific cytoplasmic membranes to the selective Cas toxin is the most remarkable feature of cytotoxicity of Cas toxin on plant cells. Finally, researcher's exploration is crucial to understand the basic molecular mechanism underlying the host-selective toxic interaction of Cas toxin with cytoplasmic membranes in plant cells.

Keywords : cassiicolin, corynespora leaf fall disease, high-speed AFM, giant liposome vesicles
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