

The discovery and applications of cyclotides in drug design and agriculture

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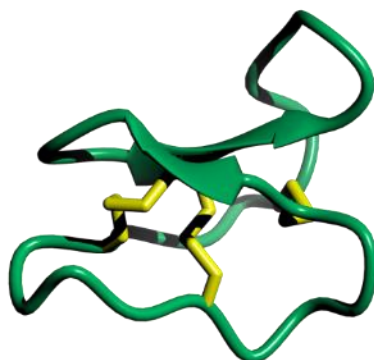
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Abstract: Our work focuses on the discovery of cyclic peptides in plants and their applications in drug design and agriculture. We have a particular interest in a family of proteins called cyclotides, which comprise ~30 amino acids and incorporate three disulfide bonds arranged in a cystine knot topology, which makes them exceptionally stable. Cyclotides occur in all plants from the Violaceae family and in certain plants from the Rubiaceae, Cucurbitaceae, Solanaceae and Fabaceae, where they are present as host defense agents against insects and nematodes. A single plant may contain dozens to hundreds of cyclotides expressed in a wide range of tissues, including leaf, flower, stem and roots. Their stability and compact structure makes cyclotides an attractive protein framework onto which bioactive peptide epitopes can be grafted to stabilise them. Because plants produce cyclotides in large quantities (up to 2g/kg plant weight) we are using crop plants as expression systems for the production of pharmaceutically active cyclotides. This presentation will give an overview on the discovery, biosynthesis and applications of cyclotides, with a focus on their applications as eco-friendly pesticides. I will also describe the use of transgenic plants as vehicles for the production of cyclotide-based drug leads for cardiovascular disease.

Graphical abstract:



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