**Genome Mining of Fungal Natural Products for Crop Protection**

by

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Genome mining refers to the process of discovering biosynthetic gene clusters (BGCs) responsible for biochemical pathways and production of secondary metabolites (SMs) by exploiting genome sequences. Fungi produce a wide array of polyketide-derived SMs with significant agricultural, pharmacological, and industrial value. In this talk, top-down and bottom-up approaches to study fungal BGCs will be presented. Using a combination of genetic and bioinformatic analyses, several BGCs responsible for the biosynthesis of polyketides with antifungal activities were identified in plant-pathogenic fungi, endophytic fungi, and lichen-forming fungi. In particular, BGCs for the production of structurally diverse SMs found in cortical and medullary layers of lichen thalli were discovered by genome mining of 100 lichen species. Fungi often harbor self-resistance genes within their BGCs to protect themselves from the antifungal compounds they produce. A self-resistance gene against cercosporamide, which exhibits strong antifungal activity against pepper anthracnose pathogens, was identified within the cognate BGC. With these functionally characterized BGCs, the development of fungal cell factories for mass production of antifungal SMs through metabolic engineering is underway.