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Recent Topics on Action Mechanisms of Fungicides

Isamu Yamaguchi[1)] and Makoto Fujimura[2)]

1) RIKEN Plant Science Center
2) Faculty of Life Science, University of Toyo

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Abstract:
Plant diseases are damaging to crop production in a temperate and humid climate like that of Japan, which has resulted in the development of many excellent fungicides, but wide-spread use of site-specific fungicides can cause pathogens to develop resistance in the field. While all modern fungicides have been developed through extensive safety evaluation, there is deep public concern about their side effects on non-target organisms. Thus there is a growing interest in non-fungicidal disease-controlling agents since they are supposedly specific to target organisms and less likely to cause resistance. Two groups of non-fungicidal rice blast chemicals are currently on the market; melanin biosynthesis inhibitors (MBIs) and plant defense activators or priming effectors which induce host resistance against the pathogen's attack. Recently, field isolates resistant to MBI-D have emerged and molecular mechanisms of action/resistance are attracting interest. Complex III in the electron transport system of fungal mitochondria which contains a cytochrome *b* with two ubiquinone binding sites, Qo and Qi, is another novel target of fungicides. Methoxyacrylate fungicides are known to block electron flow by binding to the Qo site. Resistance to Qo inhibitors has been observed in field isolates with a point mutation in the cytochrome *b* gene (G143A). While dicarboximide fungicides have been applied to protect various crops and vegetables against gray mold and other diseases, their mechanisms of action have remained unclear for many years; recent study revealed that dicarboximides interfere with the osmotic signal transduction pathway consisting of histidine kinase and MAP kinase cascades. The mutations conferring dicarboximide resistance in the field have been identified within the histidine kinase genes in *Botrytis cinerea* and *Alternaria alternata*. Thus management strategies for fungicide resistance may become a part of registration requirements

Keywords:
melanin biosynthesis inhibitors, plant activators, methoxyacrylate fungicides, fungicide resistance, osmotic signal transduction pathway

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