

S32-4 Small molecules causing “Fairy Rings”

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For centuries, people around the world have been mystified by the formation of rings of accelerated plant growth in woodlands and grassy fields. The rings sometimes erupt with mushrooms, adding to the intrigue. Myth led these geometric patterns of plant growth to be called fairy rings. In 2010, we discovered that the “fairy” is a plant-growth regulator, 2-azahypoxanthine (AHX). Furthermore, we isolated a plant growth inhibitor, imidazole-4-carboxamide (ICA), from the same fungus. In 2014, we reported some new findings. Namely, we found a common metabolite of AHX in plants, 2-aza-8-oxohypoxanthine (AOH). AHX is chemically synthesized from 5-aminoimidazole-4-carboxamide (AICA), and AHX can be converted into AOH by xanthine oxidase. AICA is one of the members of the purine metabolic pathway in animals, plants, and microorganisms. However, further metabolism of AICA had remained elusive. Based on these results and facts, we hypothesized that plants themselves produce AHX and AOH through a pathway similar to the chemical synthesis. As a result, we demonstrated the existence of endogenous AHX and AOH and a novel purine pathway to produce them in plants. In addition, these compounds increased the grain yields of wheat and rice in field experiments.