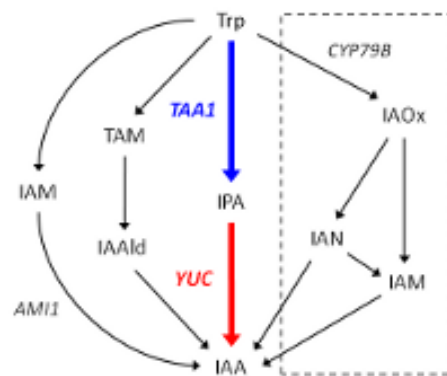


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Researchers clarify main auxin biosynthesis pathway

New findings by scientists at the RIKEN Plant Science Center (PSC) have shed first-ever light on the biosynthesis pathways of a family of phytohormones known as auxins, which play a central role in plant growth and development. The findings open the door to new techniques for boosting crop yields, helping to tackle the world's pressing agricultural challenges.

By promoting cell expansion, division and differentiation, and regulating developmental events and environmental responses, the family of plant hormones known as auxins is central to a wide variety of growth and behavioral processes in the plant's life cycle. As the most abundant and potent auxin, indole-3-acetic acid (IAA) in particular, discovered more than 70 years ago, plays a fundamental role in plant growth and development, yet surprisingly little is known about how it is synthesized.



Proposed IAA biosynthesis pathway

With their latest research, published in the *Proceedings of the National Academy of Sciences* (PNAS), the PSC research team and the collaborators, including Yunde Zhao of University of California San Diego, sought to clarify the pathways via which this synthesis occurs. Earlier research showed that plants synthesize IAA from tryptophan, an amino acid, via a set of four such pathways, and the team's own research in 2009 indicated that IAA biosynthesis may vary among plant species. The overall picture of these pathways, however, remained unclear.

One point of contention with existing hypotheses concerns two families of enzymes named TAA (TRYPTOPHAN AMINOTRANSFERASE OF ARABIDOPSIS) and YUC (YUCCA), each of which is required for IAA biosynthesis. While earlier research had

placed these two families on distinct biosynthesis pathways, mutants deficient in TAA and YUC have very similar phenotypes, suggesting a linear relationship between the two.

Through a series of experiments on *Arabidopsis* using advanced mass spectroscopy techniques and enzyme assays, the research team confirmed for the first time this linear relationship. Their findings show that the TAA and YUC families are not on separate pathways, as earlier believed, but on the same pathway, with YUC catalyzing a rate-limiting step in the synthesis of IAA from indole-3-pyruvic acid (IPA). By clarifying this key step, the discovery unravels the 70-year old mystery of how auxins are synthesized and sets the groundwork for new agricultural techniques aimed at solving the world's pressing agricultural challenges.

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of Sciences, 2011, DOI: 10.1073/pnas.1108434108

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About the Plant Science Center

With rapid industrialization and a world population set to top 9 billion within the next 30 years, the need to increase our food production capacity is more urgent today than it ever has been before. Avoiding a global crisis demands rapid advances in plant science research to boost crop yields and ensure a reliable supply of food, energy and plant-based materials.

The RIKEN Plant Science Center (PSC), located at the RIKEN Yokohama Research Institute in Yokohama City, Japan, is at the forefront of research efforts to uncover mechanisms underlying plant metabolism, morphology and development, and apply these findings to improving plant production. With laboratories ranging in subject area from metabolomics, to functional genomics, to plant regulation and productivity, to plant evolution and adaptation, the PSC's broad scope grants it a unique position in the network of modern plant science research. In cooperation with universities, research institutes and industry, the PSC is working to ensure a stable supply of food, materials, and energy to support a growing world population and its pressing health and environmental needs.

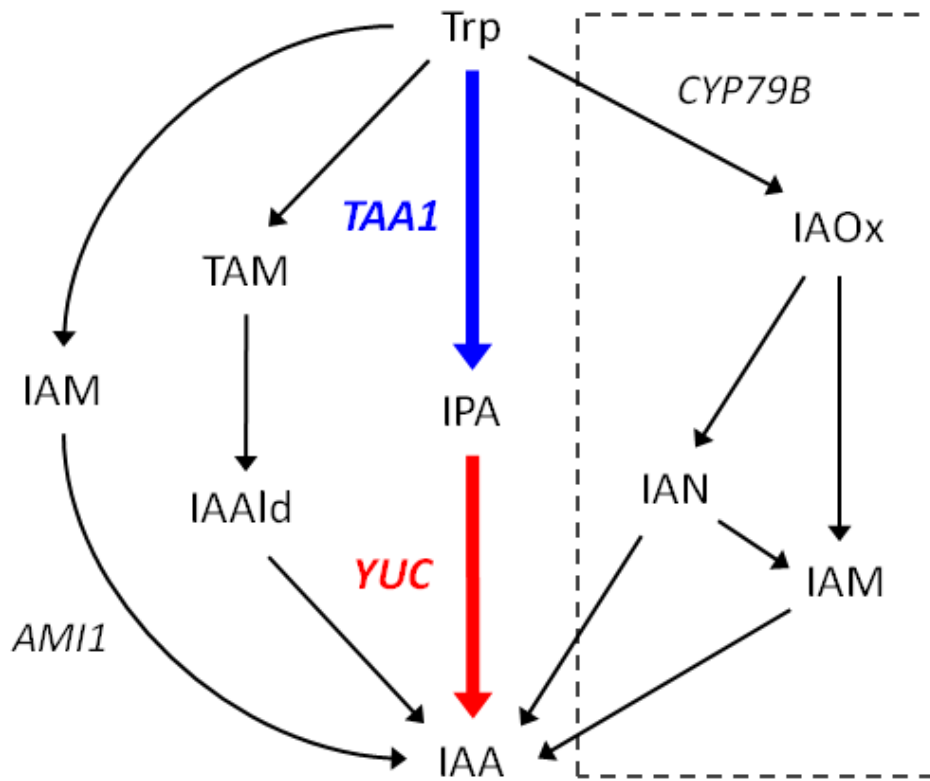


Figure 1: IAA biosynthesis pathway proposed in the present study. The bold arrows indicate proposed functions of TAA1 and YUC, respectively.



Figure 2: Plants cannot grow normally if IAA biosynthesis by TAA and YUC gene families is disrupted (Left: normal, upper right: TAA-deficient mutant, lower right: YUC-deficient mutant).