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RIKEN

Scientists uncover shared phosphoproteome linking remote plant species

Researchers at RIKEN and Keio University have shown that even the most widely-varying species of plants share remarkable similarities in the composition of proteins in them that undergo phosphorylation, a regulatory mechanism involved in various cellular phenomena. A database released by the group, with information on over three thousand phosphorylated proteins and phosphorylation sites in rice, opens new doors in the study and engineering of plants.

The addition of a phosphate group to a protein, known as phosphorylation, plays a vital role in regulating cellular phenomena and as a mediator of signaling pathways in the cell. The function of this process in regulating plant growth and development in particular makes it highly attractive for plant engineering, yet existing resources on phosphorylation are limited to model plants such as *Arabidopsis*, beyond which their applicability is unclear.

To expand the range of uses for these resources, the research group set out to determine the degree to which phosphorylation mechanisms are conserved across two very different plant species: *Arabidopsis*, from the family of flowering plants known as dicotyledons (dicots), and rice, from the family known as monocotyledons (monocots). Their large-scale analysis on rice, the first ever, identified a total of 3393 different types of proteins regulated by phosphorylation and their phosphorylation sites, of which more than half, they showed, are shared by *Arabidopsis*.

The surprising discovery that these two very different plants exhibit significant similarities in their mechanisms of phosphorylation suggests that information on the “phosphoproteome” of one species can be applied to others, greatly contributing to applications in plant engineering.

Data leading to the discovery has been made available to the public in an open-access database, the Plant Phosphoproteome Database, released online on May 12.

For more information, please contact:

Dr. Ken Shirasu
Plant Immunity Research Group
RIKEN Plant Science Center (PSC)
Tel: +81-(0)45-503-9574 / Fax: +81-(0)45-503-9573

Dr. Hirofumi Nakagami
Plant Proteomics Research Unit
RIKEN Plant Science Center (PSC)
Tel: +81-(0)45-503-9424 / Fax: +81-(0)45-503-9573

Ms. Tomoko Ikawa (PI officer)
Global Relations Office
RIKEN
Tel: +81-(0)48-462-1225 / Fax: +81-(0)48-462-4715
Email: koho@riken.jp

About the RIKEN 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.

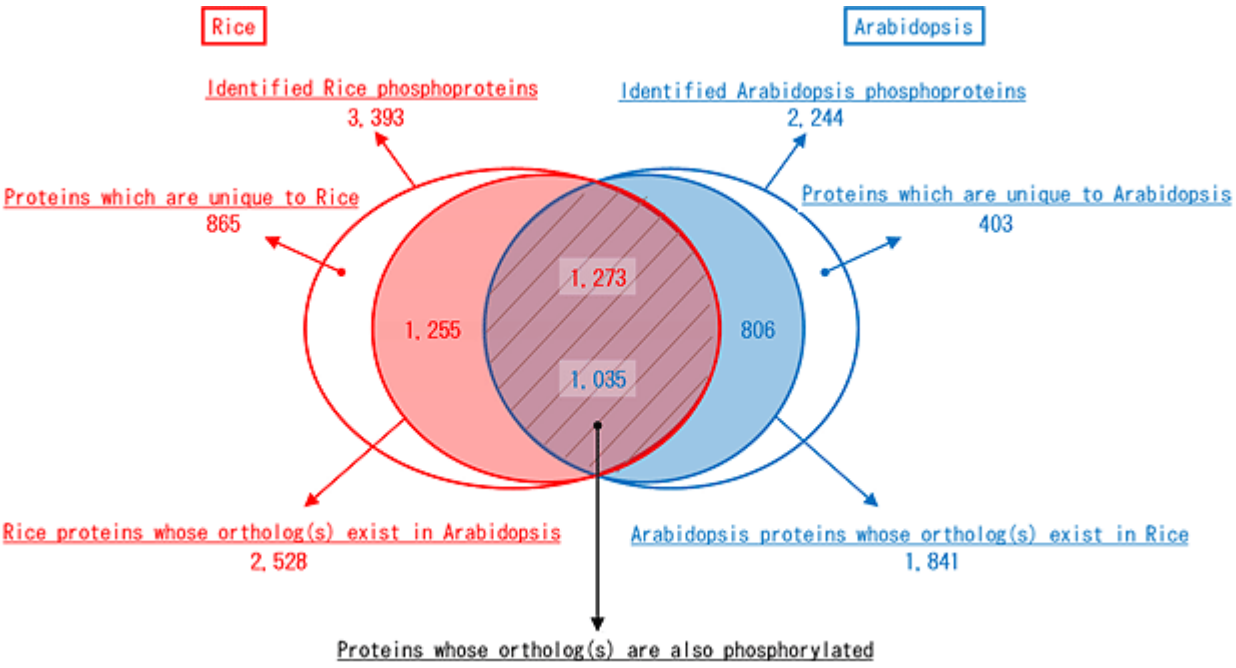

Figure 1: Overlap between rice and Arabidopsis phosphoproteomes.

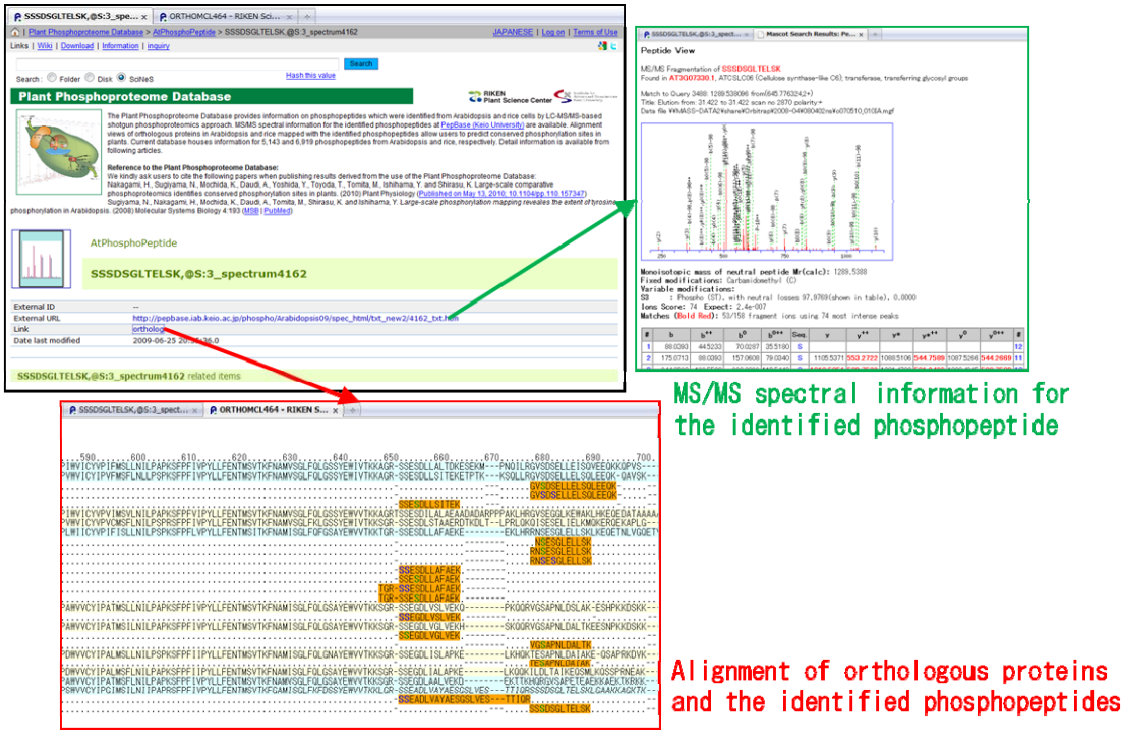

Figure 2: Plant Phosphoproteome Database.