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The Plant Cell

Gene Boosts Rice Growth and Yield in Salty Soil

Soil salinity poses a major threat to food security, greatly reducing the yield of agricultural crops. Rising global temperatures are expected to accelerate the buildup of salt in soil, placing an increasing burden on agricultural production. In a new study published in *The Plant Cell*, a team of researchers identified a gene that limits yield losses in rice plants exposed to salt stress and deciphered the underlying mechanism.

Contact:
Tyrone Spady, PhD
Director of Legislative and Public Affairs
American Society of Plant Biologists
tspady@aspb.org
301-251-0560 ext. 121

THE PLANT CELL
AMERICAN SOCIETY OF PLANT BIOLOGISTS

Gene Boosts Rice Growth and Yield in Salty Soil

Discovery of a gene that helps rice plants grow in salty soil paves the way to developing salt-tolerant crops

Around 20% of the world's irrigated land is considered to contain elevated concentrations of salt, and the soil continues to get saltier as the climate warms. Agricultural production is hard hit by soil salinity; salt stress reduces the growth and yield of most plants, resulting in billions of dollars in crop yield losses annually. Rice—the staple food of more than half the world's population—is particularly sensitive to salty soil, with even moderate levels of salt resulting in substantial yield losses. There is thus an urgent need to develop rice lines that can withstand salty conditions.

A team of scientists led by Jian-Zhong Lin and Xuan-Ming Liu of Hunan University in Changsha, China recently identified a gene that contributes to salt stress tolerance in rice. The gene, which they named *STRK1* (*salt tolerance receptor-like cytoplasmic kinase 1*), was activated under salt stress conditions. The researchers generated two sets of transgenic plants, one in which *STRK1* was expressed at high levels, and the other in which expression was greatly reduced. Under regular growth conditions, both sets of transgenic plants appeared normal. However, when challenged with salt, the transgenic plants with elevated *STRK1* expression were greener and larger than



Members of the research team collecting samples in a rice paddy field in Changsha, China.

the non-transgenic control plants, and those with reduced levels of *STRK1* expression were smaller and browner than the controls.

Next, the team examined the effect of *STRK1* on yield. "Notably, overexpression of *STRK1* in rice not only improved growth but also markedly limited the grain yield loss under salt stress conditions," said Jian-Zhong Lin.

The team then turned their attention to deciphering the mechanism by which *STRK1* enhances the plant's tolerance to salt. Salt stress triggers the production of potentially harmful reactive oxygen species, such as hydrogen peroxide, in plant cells. The group found that *STRK1* (the protein encoded by *STRK1*) interacts with and activates a protein named CatC, which belongs to a family of proteins that decomposes hydrogen peroxide into water and oxygen. Thus, *STRK1* increases the plant's tolerance to salt stress by keeping the levels of hydrogen peroxide in check, and thereby minimizing the damage caused by accumulating reactive oxygen species.

These exciting findings bring the research community closer to developing rice plants that thrive in salty soil. "Agricultural productivity is increasingly threatened by the salinization of irrigated farmland...Our work demonstrates that *STRK1* is a promising candidate gene for protection of yield in crop plants exposed to salt stress," stated Xuan-Ming Liu.

Author:

Kathleen L. Farquharson, PhD
kfarquharson@aspb.org
Science Editor, *The Plant Cell*
<http://orcid.org/0000-0002-8032-0041>

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To obtain an advance copy of the manuscript, please contact kfarquharson@aspb.org.

About the researchers: To arrange an interview with a member of the team that conducted this study, please contact Dr. Jianzhong Lin of the College of Biology, Hunan University, Changsha, China at jianzhlin@163.com.

About *The Plant Cell*: Published monthly by ASPB, *The Plant Cell* (<http://www.plantcell.org/>) is the highest-ranking primary research journal in plant biology. *The Plant Cell* publishes novel research in plant biology, especially in the areas of cellular biology, molecular biology, genetics, development, and evolution. The primary criteria for publication are that the article provides *new insight that is of broad interest* to plant biologists, not only to specialists, and that the presentation of results is appropriate for a wide audience.

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