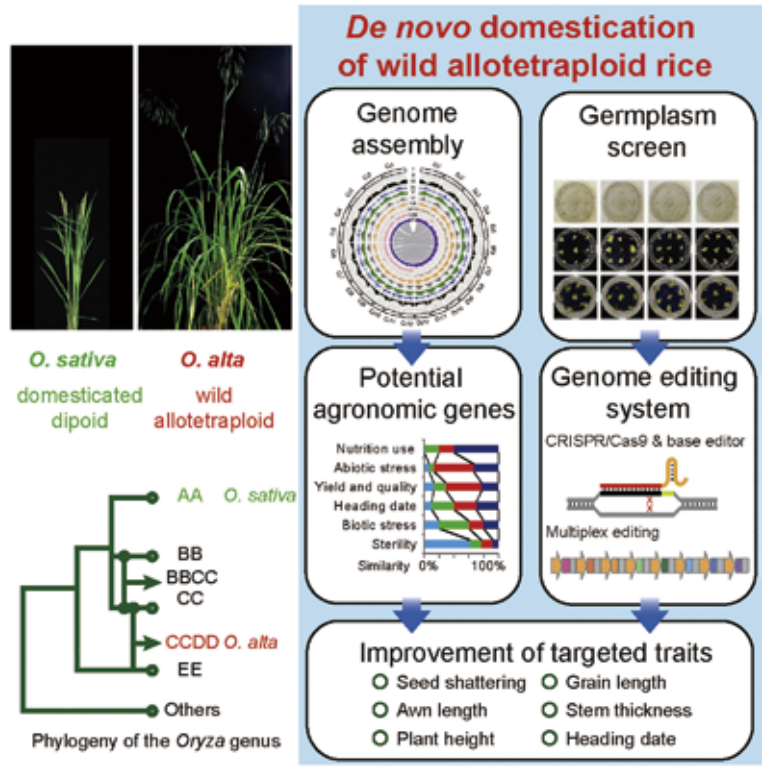
Life Sciences

Scientists Provided and Practiced a Rational Strategy for Creating Novel Type of Rice Crop from a Wild Allotetraploid Rice

Recently, Prof. LI Jiayang's group from the CAS Institute of Genetics and Developmental Biology (IGDB) and his collaborators made a breakthrough toward creating novel crops through *de novo* domestication of wild allotetraploid rice, which has launched a revolution for sustainable agriculture in creating future crops. This work entitled "A route to *de novo* domestication of wild allotetraploid rice" has been published online in *Cell* on February 3, 2021.



De novo domestication of wild allotetraploid rice. (Image by IGDB)

To meet the world summit on food security, 50% more food is required by 2050, posing enormous pressure on increasing the yield per unit area. This challenge becomes even greater owing to rapid climate changes. Cultivated rice is now the staple food feeding more than half of the world's population, which is all diploid.

Domestication of wild rice into cultivated crops spends thousands of years, accompanied with narrowed genetic diversity in the species populations. Compared with the cultivated diploid rice, South American species with a polyploid CCDD genome show a significantly higher biomass and greater resistance to biotic and abiotic stresses.

To create novel polyploid rice crop, Prof. LI has launched a strategy for *de novo* domestication of wild allotetraploid rice, which includes four steps: (1) selecting a wild allotetraploid rice material suitable for *de novo* domestication; (2) establishing an efficient transformation system for the targeted material; (3) assembling and analyzing a high-quality reference genome of the material; and (4) targeted editing of several domestication- and agronomy-related key genes to improve the important traits.

LI's group and his collaborators then screened

allotetraploid wild rice inventory and identified one genotype of *O. alta* (CCDD), Polyploid Rice 1 (PPR1) to establish two important resources for its *de novo* domestication: 1) an efficient tissue culture, transformation and genome editing system, and 2) a high-quality genome assembly discriminated into two subgenomes of 12 chromosomes apiece. With these resources they showed that six agronomically important traits could be rapidly improved by editing *O. alta* homologs of the genes that control these traits in diploid rice.

These results demonstrated that the proposed strategy is rational and practical, and *de novo* domesticated allotetraploid rice can be developed into a new staple cereal to strengthen world food security.

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Reference

Hong Yu, Tao Lin, Xiangbing Meng, Huilong Du, Jingkun Zhang, Guifu Liu, . . . Jiayang Li, (2021) A route to *de novo* domestication of wild allotetraploid rice. *Cell* 184, 1156. doi: 10.1016/j.cell.2021.01.013.