NRI research highlights
NATIONAL RESEARCH INITIATIVE COMPETITIVE GRANTS PROGRAM

United States Department of Agriculture

Cooperative State Research, Education, and Extension Service

2003 No. 1

Sequencing the rice genome and how this will change agriculture

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While the Human Genome Project has changed our perspective of humankind and has initiated a revolution in medicine and diagnostics, the sequencing of the rice genome has created an equal revolution in plant biology and agriculture. Rice is a cereal and is closely related to economically important crop plants including corn, wheat, barley, sorghum, and sugarcane. Unlike rice, these species have large genomes and although a genome sequencing project for each of these crops would be desirable, it is currently not feasible for all of these species due to technical and fiscal constraints.

Rice is a cereal with a relatively small genome making it an ideal plant to sequence

However, since the rice genome is compact and is of significant agricultural importance world-wide, it has been the target of an international genome sequencing effort.

The U. S. is a member of the International Rice Genome Sequencing Project (IRGSP), and four groups lead by Drs. C. Robin Buell of The Institute for Genomic Research, Rod A. Wing of the University of Arizona, William R. McCombie of Cold Spring Harbor Laboratory and Richard Wilson of Washington University were funded by the USDA to sequence portions of the rice genome. First focusing on rice chromosome 10 and now on rice chromosomes 3 and 11, these four groups (U. S. Rice Genome Sequencing Project (USRGSP) have contributed approximately 81 Mb of the available 513 Mb (~16 %) rice genome sequence. For more information see the US rice genome sequencing project website at: http://www.usricegenome.org/

Recently, the USRGSP and collaborators completed the sequence and analysis of

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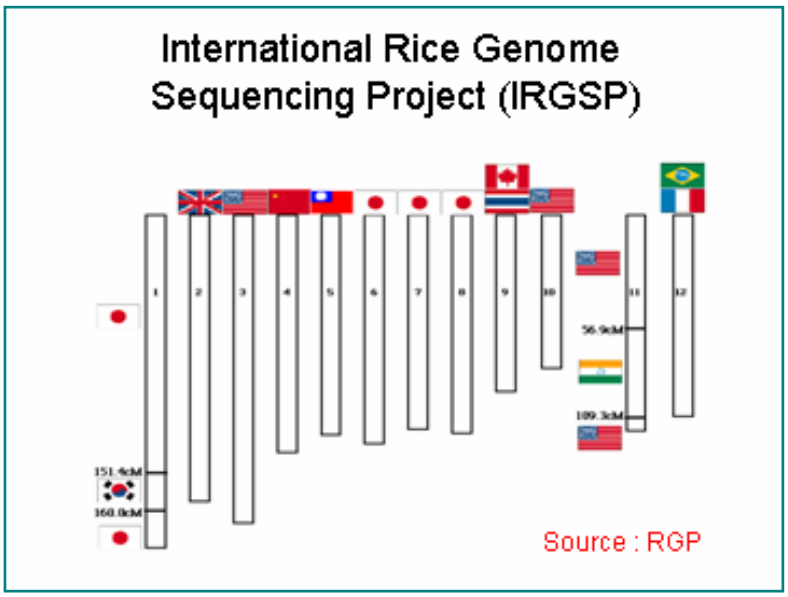
rice chromosome 10 (Rice Chromosome 10 Sequencing Consortium, Science 300:1566-1569, 2003). Although chromosome 10 is the smallest rice chromosome, approximately 3500 genes were identified. A large number of these genes are present in other plant species and could be assigned a function. With respect to improvement of rice production, a number of disease resistance genes were present on chromosome 10 and these genes provide a new set of candidate genes for breeders to improve current rice varieties.

A major finding in rice chromosome 10 was the documentation of the value of rice in comparative studies with other crop species. In a comparison with maize and sorghum, rice chromosome 10 is very similar at the genome level and will be valuable for work in other cereal species. These data suggest that even partial genome sequence for other crop species can be leveraged using the complete rice genome. Thus, the benefits of sequencing the rice genome are not limited to rice and will be seen in other crop species of significant economic importance in the US such as maize and wheat. With the completion of chromosome 10, the USRGP members are now focused on finishing chromosomes 3 and 11 as well as other regions to fulfill the IRGSP commitment of completing the entire rice genome by the end of 2004.



The research reported in this factsheet was sponsored by the Rice Genome Program of the National Research Initiative Competitive Grants Program. To be placed on the mailing list for this publication or to receive additional information, please contact the NRI (202-401-5022 or NRICGP@reeusda.gov). The factsheet also is accessible via the NRI section of the Cooperative State Research, Education, and Extension Service website at http://www.reeusda.gov/nri.