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Title of the Application	Diagnostic Kit and Method for Sweet-Based Rice Blight Resistance and Resistant Breeding Lines (hereinafter "Sweet")
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BRIEF BACKGROUND

Bacterial blight is recognized as one of the main diseases of rice plants, and it is among the most destructive afflictions of cultivated rice (Oryza sativa and O. glaberrima). Symptoms of rice bacterial blight include the wilting and yellowing of leaves or seeds, with infected leaves turning grayish green and rolling up. As the disease progresses, the leaves turn yellow to straw-colored and wilt, leading whole plants to dry up and die.

This disease thrives in warm, humid environments, and has been observed in rice-growing regions of Asia, the western coast of Africa, Australia, Latin America, and the Caribbean. Bacterial leaf blight can be devastating if it comes early. Yield losses range from 20% to more than 70% in Southeast Asia and India. In Africa, bacterial blight has become a serious disease, particularly of irrigated rice in the Sahel. Millions of hectares of rice are infected annually, and there have been regular epidemics since 2002 in a number of countries. For example, in Niger, losses in irrigated areas in 2013 range from 19 to 63%, estimated to cost US$400-1000/ha.

The causal agent of bacterial blight is the bacterium Xanthomonas oryzae pathovar oryzae (also referred to as Xoo). Methods of controlling rice bacterial blight have varying levels of

effectiveness. Chemical control has been largely ineffective in minimizing bacterial blight because of safety concerns, practicality, and bacterial resistance. Biological control methods, which rely on the use of bacterial antagonists of pathogens can reduce bacterial blight, though their use has been limited. Development of blight-resistant rice lines has been found to be the most effective solution for bacterial blight, as resistant rice varieties have successfully reduced yield losses in many rice-producing countries.

PATENT APPLICATION

This patent application is based on research results produced by an international scientific consortium led by HHU (https://www.healthycrops.org/). It relates to the invention of a kit for detecting and implementing rice blight resistance based on variation in SWEET promoters, comprising (1) (i) PCR primers for amplifying SWEET11a, SWEET13, and SWEET14 cDNA; and / or (ii) rice promoter reporter lines for SWEET11 a, SWEET13, and SWEET14 accumulation; (2) rice knock out lines for SWEET11 a, SWEET13, and SWEET14 genes; and (3) tester rice lines genome-edited in the SWEET11 a, SWEET13, and / or SWEET14 promoter region for evaluating the efficacy of the respective mutation for resistance.

The invention also includes a method for implementing strong and wide rice blight tolerance using genome-edited SWEET promoter sequences. These SWEET mutations have been developed from varieties derived from in-trust germplasm and genetic resources obtained under SMTA from the Multilateral System of the International Treaty of Plant Genetic Resources for Food and Agriculture (ITPGRFA).

This invention will help monitor the geographic and temporal spectrum of virulence of the pathogen, allowing customized intervention in each region.

The patent application, and the patent claims, do not extend to farmers' access and use of landraces per se.

As a non-profit international organization, IRRI promotes responsible technology transfer and intellectual property management in accordance with its Intellectual Property and Commercialization Policy (IP&C Policy)[1] and with the CGIAR Principles on the Management of Intellectual Assets ("IA Principles")[2].

This patent application conforms with the CGIAR Intellectual Assets Principles concerning intellectual property applications, i.e. necessary for the further improvement of the innovation or to enhance the scale or scope of impact on target beneficiaries, in furtherance of the CGIAR Vision. IRRI will continue to comply with all obligations of the SMTA including benefit-sharing, where applicable.

Future licensees will be bound by the benefit-sharing obligations under the SMTA. In addition, and as per IRRI's policy, royalties paid by future licensees to IRRI shall be shared on a voluntary basis with the benefit-sharing fund of the International Treaty for Plant Genetics for Food and Agriculture.

Additional information can be found on the following links:
https://www.mpipz.mpg.de/4969508/eom_nat_biotech_2019_OA.pdf
http://news.agropages.com/News/NewsDetail---37136.htm

CURRENT STATUS

In April 2020, a PCT application was filed. The application allows the lead applicant, Heinrich Heine University (HHU), to explore research partnerships towards the production and testing of rice varieties with a large spectrum of tolerance. Furthermore, the application supports the project's efforts to achieve significant yield increases for small-scale producers in low- and middle-income counties, especially in Africa and Asia. The Bill & Melinda Gates Foundation holds non-exclusive rights to the patent, which is thought to be used in future exclusively for humanitarian, non-profit-based approaches.

The dissemination and impact strategies will be defined and led by HHU, as per the IRRI – HHU Agreement.

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[1]Available at http://books.irri.org/Approved-IPC-Policy-291017.pdf
[2]Available at https://storage.googleapis.com/cgiarorg/2018/03/CGIAR-IA-Principles.pdf