



BCIL **Biotech Consortium India Limited**

## Crop protection by RNP complexes against bacterial diseases

TECHNOLOGY AVAILABLE FOR TRANSFER

### UNMET NEED AND OPPORTUNITY

Crop protection methods involving chemical pesticides to fight bacterial threats like blight, speck, and wilt harm the environment, endanger human health, and often prove ineffective as pathogens develop resistance. A new method that uses gene editing through CRISPR-Cas9 technology has been proposed to target and disable harmful bacteria in plants, leading to increased yield and disease resistance in various plants. Further rising incomes and urbanization led increase in consumption of fruits, vegetables, and other high-value crops, has created an increased need for newer pest control measures that are safer, and more effective beyond traditional chemical pesticides.

### INTELLECTUAL PROPERTY

Patent Application is filed in India with a priority date of 2023.

### UNIQUE SELLING PROPOSITION

- Targeted action: Highly targeted RNPs to specific pathogen.
- Wider scope of application in any plant.
- Multiple pest control though single formulation.
- Environment-friendly biodegradable solution for pest control in plants.
- Transgene-free method of crop protection.

### STAGE OF DEVELOPMENT

The technology is proven at the lab scale (TRL-3) and is primed for seamless scaling to meet industry demands.

### LATERAL APPLICATION

This technology can also be employed by researchers in basic labs and industrial fermentation to precisely alter bacterial genes in the lab, providing valuable insights into gene function.

### TECHNOLOGY

- Nano formulation containing Cas9 and gRNA to be exogenously sprayed to the infected plants.
- Delivery of ribonucleoprotein (RNP) complexes which targets specific bacterial virulent genes *hrpX*, *hrpG*, *hrpB* and *HopP1*.
- Individual or combination of gRNA complexes used for different diseases.
- The proposed technology targets pathogen virulence factors to protect from bacterial blight causing *Xanthomonas oryzae* pv *oryzae* (Xoo) on rice, bacterial speck causing *Pseudomonas syringae* pv. *tomato* DC3000 on Arabidopsis and bacterial wilt causing *Ralstonia solanacearum* on potato.
- RNPs nano formulation with enhanced penetration and efficiency.
- A pipeline and SOPs to RNP application to target other genes in bacteria

## EXPERIMENTAL DETAILS

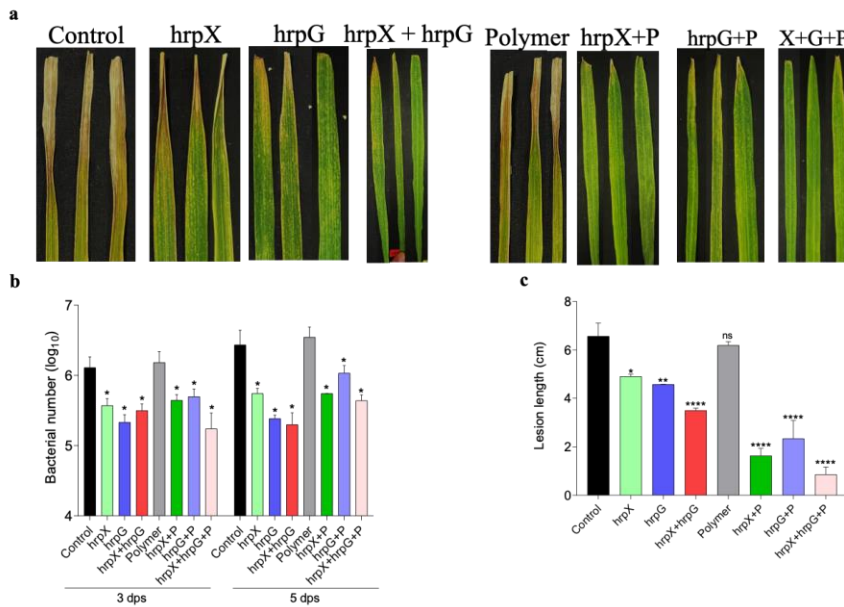


Fig. 1: Effectiveness of foliar spraying RNP complex against hrpX and hrpG on bacterial blight (caused by *Xanthomonas oryzae*) infected leaves of rice. (a) Pictorial representation of decreased disease symptoms (b) *Xanthomonas oryzae* pv *oryzae* (*Xoo*) Bacterial multiplication rate after 3 and 5 days post spray of RNP complex (c) Lesion length after 10 days post spray of RNP Complex.

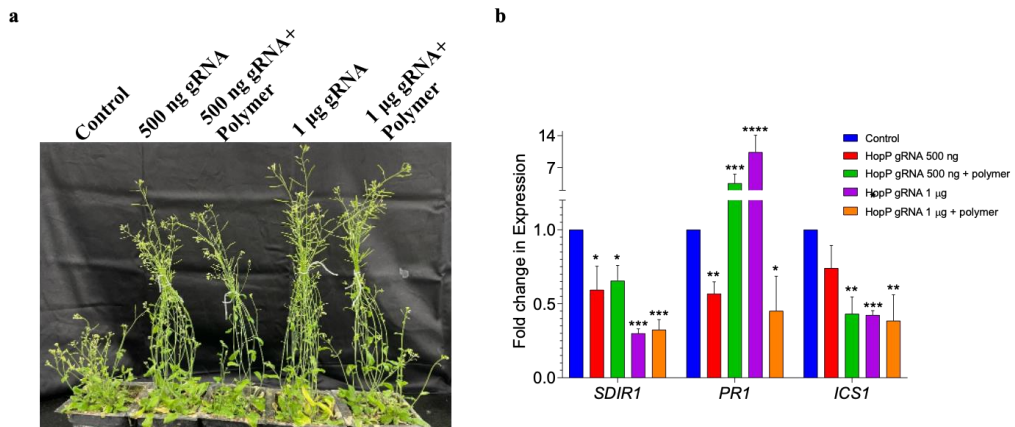


Fig. 2: Disease causing potential of *Pseudomonas syringae* bacteria treated with RNP complex against hopP1 gene in Arabidopsis plants. (a) Phenotype of plants after 10 days post-infection with treated bacteria (b) Expression of susceptible genes *SDIR1* of the treated bacteria and pathogenesis-related genes *PR1* and *ICS1* of the plant.

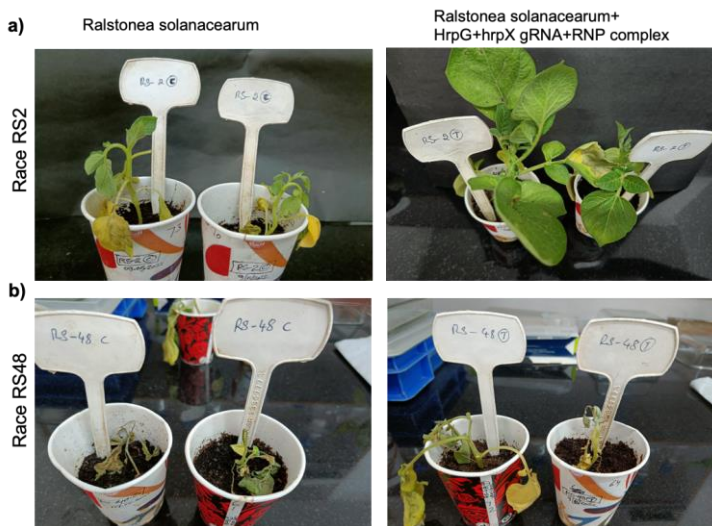


Fig.3: Effectiveness of foliar spraying RNP complex against hrpG and hrpB on bacterial wilt (caused by *Ralstonia solanacearum*) infected potato plants. (a) Bacterial disease symptoms after 10 days post infection of RS2 strain infection and 9 days post spray of RNP complex spray (b) Bacterial disease symptoms after 10 days post infection of RS48 strain infection and RNP complex.

### LICENSING OPPORTUNITY

BCIL is looking for a passionate industrial partner involved in agrochemicals, research labs focused on functional genomic studies as licensee to scale the impact of this technology from lab to the market.

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