iberian PLANT BIOLOGY 2023

Braga Portugal
9-12 July

XVIII Portuguese Spanish Congress of Plant Biology

XXV Meeting of the Spanish Society of Plant Biology

BOOK OF ABSTRACTS

Portuguese Society of Plant Biology

Spanish Society of Plant Biology

ISBN 978-989-33-4917-5

Published: July 2023

PS1-21

Empowering plant protection with HBP2: a new era of plant disease control

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The aim of this study was to investigate the potential of the novel antimicrobial protein, "HBP2," as a vaccine to enhance induced resistance in plants against various diseases, with a particular emphasis on *Pseudomonas syringae* pv. tomato DC 3000 (Pst). The primary hypothesis was that HBP2 could activate plant immune responses and serve as a potent inducer of resistance against Pst. The ultimate goal of this study was to contribute to the development of more effective strategies for plant disease management, which has important implications for global food security and agricultural sustainability.

To characterize the antimicrobial properties of HBP2, minimum inhibitory concentration (MIC) was determined. The morphological changes of the bacterial cells treated with HBP2 were observed with scanning electron microscopy. The plant treatment involved protein infiltration in the cotyledons 24 hours before bacteria inoculation by dipping. Disease rate was determined by measuring the percentage of dark-brown spots on the leaf surface 72 hours post-infection, and disease incidence was calculated by counting the number of Pst CFUs per gram of leaves using the serial dilution method. Hormonal analysis was performed using an HPLC system.

The results indicated that HBP2 acted in a dose-dependent manner and effectively destabilized the bacterial cell membrane, allowing it to penetrate and act as a bactericidal agent. Furthermore, tomato plants that were treated with HBP2 and subsequently infected with Pst showed a reduction in disease symptoms as well as CFU/ml in both preventive and curative effects. Although HBP2 did not significantly increase the main hormones involved in plant defense, such as Salicylic acid and Jasmonic acid, it did stimulate OPDA, which was a mobile signal for ISR induction.

The results suggest that HBP2 has significant potential as a vaccine, activating plant immune responses and improving induced resistance against Pst. The application of HBP2 led to a substantial reduction in the size of disease lesions caused by Pst, thus controlling bacterial speck diseases in tomatoes in both preventive and curative effects. The study establishes that HBP2 can be an effective tool for safeguarding tomato plants against Pst.