

Role of Defense-Related Genes in the Early Stages of the Actinorhizal Symbiosis

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The soil actinomycete *Frankia* has the ability to establish a nitrogen-fixing symbiosis on the roots of actinorhizal plants. The symbiotic process involves a complex interplay between the host and its symbiont, and results in a drastic alteration of the expression of the host actinorhizal genes. Within the framework of a bilateral project PESSOA (Portugal/France), the role of defense related genes was investigated during the symbiotic interaction between the tropical tree *Casuarina glauca* and the *Frankia* strain Cc13.

Transcriptomic and proteomic analyses are in progress to reveal the molecular mechanisms of the plant response upon *Frankia* infection. Gene expression profiles during the early stages the symbiotic process have been analyzed by means of a cDNA array including 15,000 non-redundant Expressed Sequenced Tags. A number of genes involved in the defense response to pathogens and other stresses were found to be up-regulated. A proteomic analysis is also being developed and will contribute to additional knowledge about root differentiation during nodule development.

Together with the global «omic» approaches, several candidate genes have been chosen for functional analysis, based on their putative link in defense response. These genes were identified among cDNAs from young nodules of *C. glauca*. Two of them, *CgChi3* (encoding a class III chitinase) and *CgHin1* (encoding a homologue of hairpin inducing protein) were expressed preferentially in nodules as compared to uninoculated control roots and leaves. Their expression was further regulated by salicylic acid and wounding. To shed light on the functions of these genes, promoter studies in *C. glauca* and *Lotus japonicus*, mutant complementation analysis in *Arabidopsis* and the production and characterization of the encoded proteins are in progress. RNA interference based on hairpin constructs introduced via *Agrobacterium rhizogenes* will also provide further data on the putative role of these defense-related genes during infection and nodule ontogenesis in *C. glauca*.

All these data should contribute to significant insights in the communication that is required to establish a peaceful symbiotic relationship between *Frankia* and its actinorhizal host.

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CHINA FORESTRY PUBLISHING HOUSE

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Front cover photos by: Chonglu Zhong, Yong Zhang and Yu Chen

Back cover photos by: Chonglu Zhong, Khongsak Pinyopusarerk and Qingbin Jiang

图书在版编目(CIP)数据

提高木麻黄林木生产力 改善林农生计: 2010年3月21-25日中国海口第四届木麻黄国际会议论文集 = Improving Smallholder Livelihoods through Improved Casuarina Productivity: Proceedings of the 4th International Casuarina Workshop, Haikou, China 21-25 March 2010: 英文 / 仲崇禄等编. - 北京: 中国林业出版社, 2011. 11

ISBN 978 - 7 - 5038 - 6365 - 3

I. ①提… II. ①仲… III. ①木麻黄 - 国际学术会议 - 文集 - 英文 IV. ①S792.93 - 53
中国版本图书馆 CIP 数据核字(2011)第 221766 号

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Chinese Publications Number of Archives Library: 2011-221766

ISBN 978-7-5038-6365-3

Improving Smallholder Livelihoods through Improved Casuarina Productivity: Proceedings of the 4th International Casuarina Workshop, Haikou, China 21-25 March 2010. Chonglu Zhong, Khongsak Pinyopusarerk, Antoine Kalinganire and Claudine Franche (eds) 2011. 11 :272pp.

1. Improving… 2. Zhong… 3. Casuarina-International Meeting-Proceedings-English 4. S792.93-53

First Published in the P. R. China in 2011 by China Forestry Publishing House

No. 7, Liuhaihutong, Xicheng District, Beijing 100009

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Price: RMB 60.00