cDNA Cloning and Sequence Analysis of a Pathogen-Induced Thaumatin-Like Protein from Rice (Oryza sativa)

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Induced resistance in rice (Oryza sativa) against the rice blast fungus Pyricularia oryzae can be triggered by a prior inoculation with the nonhost pathogen Pseudomonas syringae pv. syringae (Smith and Métraux, 1991). The onset of this resistance correlates with the activation of putative defense genes. Recently, we described the isolation and characterization of a cDNA encoding a peroxidase that is induced locally but not systemically after infiltration of rice leaves with P. syringae pv. syringae (Reimmann et al., 1992). Here we report the complete sequence of a cDNA encoding a thaumatin-like protein (Table 1).

The 663-nucleotide long cDNA (without the poly[A] tail) contains an open reading frame of 177 amino acids beginning with an ATG start codon at position 29 and ending with a TAA stop codon at position 560. The first 26 amino acids code for a putative signal peptide, indicating that the protein enters the secretory pathway. Sequence comparison with thaumatin, a sweet-tasting protein from the West African shrub Thaumatococcus daniellii (Edens et al., 1982), reveals 50% identical and 10% conserved amino acids, indicating that the cDNA clone pPIR2 encodes a protein belonging to the large family of thaumatin-like proteins. This family includes some pathogenesis-related proteins, the antifungal permatins, and the osmotin family of proteins that is induced during the adaptation of plants to osmotic stress (Singh et al., 1987; Linthorst, 1991; Vigers et al., 1991).

The protein encoded by pPIR2 has a similar size (17,992 D) to thaumatin and its expression in Escherichia coli. The onset of this resistance correlates with the activation of putative defense genes. Recently, we described the isolation and characterization of a cDNA encoding a peroxidase that is induced locally but not systemically after infiltration of rice leaves with P. syringae pv. syringae (Reimmann et al., 1992). Here we report the complete sequence of a cDNA encoding a thaumatin-like protein (Table 1).

Table 1. Characteristics of a rice cDNA encoding a pathogen-induced thaumatin-like protein

| Organism: Rice (Oryza sativa L. cv Nohrin). |
| Technique: The cDNA library was constructed in AZAPII (Stratagene, San Diego, CA). The insert of a clone hybridizing with a wheat cDNA encoding a pathogen-induced thaumatin-like protein was sequenced on both strands using overlapping deletions after subcloning into pBluescript SK+ (yielding clone pPIR2) according to the directions of the supplier (Stratagene). |
| Function: Encodes a thaumatin-like protein. |
| Method of Identification: Sequence comparison with thaumatin and other thaumatin-like proteins. |
| Regulation and Expression: Transcript of 0.7 kb accumulates transiently in rice leaves showing a hypersensitive reaction. |
| Feature of the Deduced Protein: The first 26 amino acids have the feature of a signal peptide, removal of which results in a putative mature protein of 151 amino acids with a calculated molecular mass of 15,668 D and a calculated isoelectric point of 4.75. |
| Location of the Protein: Not determined. |

The EMBL accession number for the sequence described in this article is X68197.

LITERATURE CITED


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