

Plant Gene Register

Nucleotide Sequence of a cDNA Clone Encoding a Thaumatin-Like Protein from *Arabidopsis*¹

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SAR in plants is found to correlate with induction of a set of putative defense genes including PR proteins (Linthorst, 1991). The PR proteins are a group of extracellular proteins that are induced by different phytopathogens such as viruses, bacteria, and fungi, and SAR-inducing compounds such as salicylic acid and 2,6-dichloroisonicotinic acid (Bol et al., 1990; Uknes et al., 1992). These proteins have been extensively studied in tobacco (*Nicotiana tabacum*) and are detected in many plant species in both dicotyledonous and monocotyledonous plants (Bol et al., 1990; Linthorst, 1991). One group of PR proteins (PR-5) is designated as thaumatin-like proteins based on the proteins' extensive homology with thaumatin, a sweet-tasting protein from *Thaumatococcus daniellii* (Cornelissen et al., 1986; Pierpoint et al., 1990). Recently, SAR has been demonstrated in *Arabidopsis* and this resistance was correlated with induction of PR proteins including a thaumatin-like protein (Uknes et al., 1992). The thaumatin-like proteins purified from different plant systems have been shown to inhibit the growth of fungal pathogens in vitro (Vigers et al., 1991; Woloshuk et al., 1991). We are interested in constitutively expressing thaumatin-like proteins in transgenic plants to study their role in disease resistance against fungal pathogens. Here we report the sequence of a cDNA for thaumatin-like protein from *Arabidopsis*, which is different from previously reported thaumatin-like protein from the same system (Table I).

A floral meristem cDNA library constructed in λ ZAP II vector was screened with a partial cDNA for thaumatin-like protein. Two of the isolated cDNA clones (ATLP-1 and ATLP-2) were sequenced. The ATLP-1 is 1039 nucleotides long with an open reading frame starting at nucleotide 41 and ending at nucleotide position 772. The deduced polypeptide is 243 amino acids long and contains a putative signal peptide at the amino-terminal end. The nucleotide sequence of ATLP-1 cDNA showed limited nucleotide sequence similarity with other thaumatin-like proteins from plants including *Arabidopsis*. The predicted amino acid sequence of ATLP-1 is 52% identical to previously reported thaumatin-like protein (PR-5) from *Arabi-*

Table I. Characteristics of a cDNA clone (ATLP-1) encoding a thaumatin-like protein from *Arabidopsis*

Organism:	<i>Arabidopsis thaliana</i> ecotype Landsberg erecta.
Source:	cDNA library in λ ZAP vector constructed from mRNA isolated from floral meristem.
Clone Type; Designation:	cDNA, full-length; ATLP-1.
Isolation:	Screening of a flower meristem cDNA library with a partial cDNA clone for thaumatin-like protein.
Sequencing Technique:	cDNAs were rescued in plasmid form. Both strands were sequenced by the dideoxy chain termination method using plasmid DNA as template.
Gene Product:	Thaumatin-like protein.
Method of Identification:	Nucleotide and deduced amino acid sequence comparison with sequences in nucleotide and protein data bases, respectively.
Features of the cDNA:	The cDNA is 1039 nucleotides in length and contains a 732-nucleotide open reading frame. It has 40- and 267-nucleotide-long 5' and 3' untranslated regions, respectively.
Features of the Predicted Protein:	The deduced amino acid sequence consists of 243 amino acids with a calculated molecular mass of 25,948 D and a pI of 9.6. Hydropathy plot has revealed the presence of a signal peptide at the amino-terminal end.

dopsis (Uknes et al., 1992). It also showed significant homology (about 40–41% amino acid identity) to maize thaumatin-like antifungal protein and osmotins (King et al., 1988; Singh et al., 1989; Huynh et al., 1992).

The known thaumatin-like protein from *Arabidopsis* is an acidic extracellular protein. However, ATLP-1 is a basic protein with a predicted pI value of 9.6. In this respect it is more similar to osmotins, which are basic intracellular thaumatin-like proteins. The second cDNA, ATLP-2, that we sequenced is identical to ATLP-1 except that it lacked 109 nucleotides in the 3' untranslated region in front of the poly(A) tail. Hence, it is likely that ATLP-1 and ATLP-2 are derived from the same gene by differential processing of the transcript. Our results indicate that ATLP-1 is distinct

Abbreviations: PR, pathogenesis related; SAR, systemic acquired resistance.

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from the reported thaumatin-like protein from *Arabidopsis* and that there are at least two different genes coding for thaumatin-like proteins in this system. However, it is not known if the expression of ATLP-1 is induced by infection with pathogens or SAR-inducing compounds. Experiments are in progress to determine if the ATLP-1 gene product has antifungal activity.

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