Functional Analysis of Cotton RDL1 Protein

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Cotton fiber development is a highly programmed process, involving a large number of genes. Through cDNA array and RT-PCR, we isolated a *Gossypium hirsutum* RD22-1 like gene (*GhRDL*1), homologous to *Arabidopsis* RD22. *GhRDL*1 was highly expressed in elongating cotton fiber (3～15 DPA). The ORF of RDL1 encodes a protein of 335 amino acids, with a 19-amino acid signal peptide at the N-terminal and a conserved plant-specific domain, BURP, at the C-terminal. Gene bombardment assay showed that green fluorescent protein (GFP)-RDL1 fusion was localized to the cell wall of onion epidermal cells, a similar location was observed with transgenic *Arabidopsis* expressing GFP-RDL1. Detailed observation showed that the GFP-RDL1 fusion protein mainly accumulated in the cell corner, where there is a rich deposition of pectin. The GFP-BURP domain fusion protein (GFP-BURP) showed a similar sub-cellular localization. In yeast-two hybrid screen for *GhRDL*1-interacting proteins, GhEXP1 (expansin) was found to be a candidate. The interaction between RDL1 and EXP1 was confirmed by fluorescent co-localization and co-IP assays. Since expansins are reported to play a role in cell wall loosening and cell wall growth, RDL1 may participate in cell wall growth. To further analyze the RDL1 protein, GFP-RDL1 was over-expressed in cotton R15 line, and four independent transgenic lines were generated. Phenotypic analysis showed that all the four transgenic cotton lines produced more developed seed than R15, the seed weight also was increased by 21%～48%. The 100-seed-weight of R15 was 11.2 g, whereas that of the transgenic cotton lines ranged from 14.2～16.6 g.

Key words: cotton; fiber character improvement; *GhRDL*1; cell wal