Annexins are a family of at least 13 calcium-binding proteins in higher eukaryotes. They share the common features of binding phospholipids in a Ca^{2+}-dependent manner and contain a 4- or 8-fold repeated sequence of about 70 amino acid residues termed the annexin repeat. An N-terminal domain is of greater variability and may confer specific functions for each type. At least some of the annexins seem to be differentially expressed with respect to cell proliferation (Schlaepfer and Haigler, 1990). However, the biological function of the annexins is still not clearly defined. Proposed roles include exocytosis and membrane trafficking (Creutz, 1992; Gruenberg and Emans, 1993), inhibition of phospholipase A_2 (Haigler et al., 1987), and mitogenic signaling (Haigler et al., 1987).

Until now, plant annexins have been characterized biochemically and by partial protein sequences (Boustead et al., 1989; Smallwood et al., 1990; Blackbourn et al., 1992; Andrawis et al., 1993). In cotton, an annexin-containing protein fraction was found to inhibit callose synthase in vitro (Andrawis et al., 1993). In addition, a 95-bp PCR fragment was isolated from tomato that was used as a probe in northern analysis to detect varying transcript levels in different plant organs (Smallwood et al., 1992).

To obtain protein phosphatase genes (Pirck et al., 1993) from a Medicago sativa somatic embryo cDNA library (Hirt et al., 1991), we found that one of the cDNA inserts (AnnMs, see Table I) potentially encoded a protein with similarity to different animal annexins. A homology search at the NCBI with the BLAST net service showed 30 to 37% identity with AnnMs to various animal annexins. Considerable similarity (74%) was obtained between AnnMs and an unpublished Arabidopsis cDNA fragment potentially encoding an annexin-like protein (accession no. 218518).

Comparisons with the published plant partial protein sequences revealed significant similarities between the single annexin repeat units. The tomato 28-kD fragment of p35.5 (Smallwood et al., 1990), for example, has 51% identity with repeat I of AnnMs. In contrast, comparison of the four AnnMs internal repeat sequences showed only approximately 20% identity. Similar results were obtained when various animal annexins were analyzed.


