

Abstract

ALBA proteins with an affinity to nucleic acids form a conserved family among all domains of life. In eukaryotic evolution, their homologs split into two subfamilies: shorter Rpp20-like (which possess the Alba domain) and longer forms represented by the Rpp25-like subfamily (in which additional domains are recognized). Plant genomes typically encode a higher number of *ALBA* genes, which are introduced through chromatin dynamics and reorganization. Although the roles of *ALBA* homologs in plants have been intensively studied, their functions and importance have not yet been fully clarified. This study aims to find their implementation in the reproduction of *Arabidopsis*, particularly in the male gametophyte. Initial experiments uncovered expression patterns of the family in generative organs, followed by protein localizations during pollen development. Further experiments were based on colocalization assays with selected markers for various types of ribonucleoprotein particles (RNPs) in pollen. Concurrently, the Alba family was investigated in connection with the cellular heat stress response in reproductive organs with an emphasis on the male gametophyte. The uniform behavior of ALBA proteins corresponds to their action in dimeric or multimeric complexes. Surprisingly, the acquired results revealed subtle variations between ALBAs, indicating their involvement in different steps of RNA metabolism and cell adaptation to stress. Additionally, loss-of-function mutations of *ALBA* genes result in only a mild plant phenotype, whereas significant overexpression of just one *ALBA* homolog can lead to fertility reduction. Collectively, the achieved results highlighted the impact of ALBA proteins in maintaining cellular homeostasis and during plant reproduction.