

New functions for old fellows: the ASR proteins in plant development and stress responses

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The ASR (Abscisic acid, Stress, Ripening) proteins have been discovered twenty-five years ago as induced by water deficit and fruit ripening in tomato. Since then they have been demonstrated as effectively involved in several developmental stages (seed and pollen grain desiccation, seed germination, senescence, fruit ripening) and in many stress responses (water deficit, cold, salt and osmotic stresses, aluminum tolerance, pathogen infection). The characteristics of ASR as small highly hydrophilic proteins, intrinsically disordered, able to adopt an ordered structure when they interact with DNA or proteins, displaying a double cytoplasmic and nuclear localization, argue in favor of their dual role, as chaperones in macromolecule protection, as well as transcription factors in gene expression regulation. Here we report a phylogenetic overview of the ASR-family evolution story from algae to higher plants. The application of global approaches (metabolomics and proteomics) and other targeted biochemical, pharmacological, genetic and epigenetic analyses allows to provide evidence for new molecular roles and biological functions of ASR proteins in sugar metabolism and carbon resources partitioning at the cross talk of metabolic and hormonal signaling, and in the integration of environmental cues.