POSTER - PHYLOGENY AND EVOLUTION

ORIGIN, DISTRIBUTION AND EVOLUTION OF THE DOMON PROTEIN SUPERFAMILY IN PLANT LINEAGE

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Metals such as phosphorus (P) and iron (Fe) are extremely important for plant development and are absorbed by plants in the soil through different mechanisms: (I) soil solubilization via acidification, as well as the release of low molecular weight organic compounds capable of chelating, (II) reduction of soluble metal, and (III) metal transport by a membrane carrier. Ferric reduction, an important step in Fe homeostasis, has recently been demonstrated by various studies of proteins from the CYBDOM family in plants under P deficiency. Members of the CYBDOM family are characterized by possessing a cytochrome b561 (Cyt-b561) (PF03188.20), capable of electron transfer across the plasma membrane, fused to a DOMON domain (PF03351.21), initially identified in dopamine ß-hydroxylase, an enzyme that generates noradrenaline from dopamine. In Arabidopsis thaliana, 12 proteins containing the DOMON domain are described, divided into clades: F1, F2, G, and AIR12. F1 and F2 DOMON group proteins are characterized by the Cyt-b561-DOMON fusion, while the G group contains two DOMON domains associated with Cyt-b561 and

the DM13 domain (PF10517.13). The AIR12 group does not constitute CYBDOM members, as they possess a single DOMON domain (PF04526.17) associated with a glycosylphosphatidylinositol (GPI) membrane anchor, without Cyt-b561. The CYBDOM family is poorly studied, and it is not known when the fusion of the Cyt-b561 domains with DOMON occurred. Therefore, our aim was to shed light on the deep origin of proteins in this superfamily in the plant lineage. The initial search for DOMON/CYBDOM proteins began with the use of HMMER v3.3.2 against complete predicted proteomes in Archaeplastida, including 25 Embryophytes, 9 Charophytes, 16 Chlorophytes, 5 Rhodophytes, and 1 Glaucophyte. Our results showed the presence of 363 DOMON superfamily proteins distributed across all Archaeplastida groups, with 197 proteins containing the Cyt-b561-DOMON fusion (CYBDOM family members) and 143 containing only the DOMON domain. Within the CYBDOM family, 30 proteins contained the DM13 domain, distributed across all Archaeplastida groups except Chlorophyta. In addition to identifying DOMON proteins, we also predicted their subcellular locations using the DeepL v.2.0 program, which utilizes deep learning to predict protein subcellular localization. In Archaeplastida overall, the localization of DOMON proteins is concentrated in the compartments: Vacuole, Extracellular, and Plasma Membrane (PM), and it has been demonstrated in previous studies that A. thaliana CYBDOMs are localized in the PM. Our study expands the understanding of the origin and distribution of DOMON superfamily proteins in different groups of plants, offering valuable insights into the evolution of members in Archaeplastida, highlighting their importance in metal homeostasis and providing insights into their subcellular localization. These findings provide a solid foundation for future research that seeks to understand the mechanisms of metal absorption and transport more deeply in plants, with potential applications in agriculture and plant biotechnology.

Palavras-chave: comparative genomics; cybdom family; cyt-b561; metal homeostasis.