Defense and Offense Strategies: The Role of Aspartic Proteases in Plant–Pathogen Interactions

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Summary: Plants are sessile organisms that are continuously exposed to adverse environmental factors, both abiotic and biotic. Plant immunity is an intricate system that involves a remarkable array of structural, chemical, and protein-based layers of defense, aiming to stop pathogens before they cause irreversible damages. Proteases are an integral part of plant defense systems, with several hubs of action, from pathogen recognition and priming to the activation of plant hypersensitive response. Within this wide group of proteolytic enzymes, aspartic proteases have been implicated in several plant development functions and are gaining more prominence due to their involvement in plant–pathogen interactions. We highlight the current knowledge on plant and pathogenic aspartic proteases and highlight the most recent findings on their participation on plant defense, as well as in pathogen infection strategies.

The Past and the Present of Aspartic Proteases

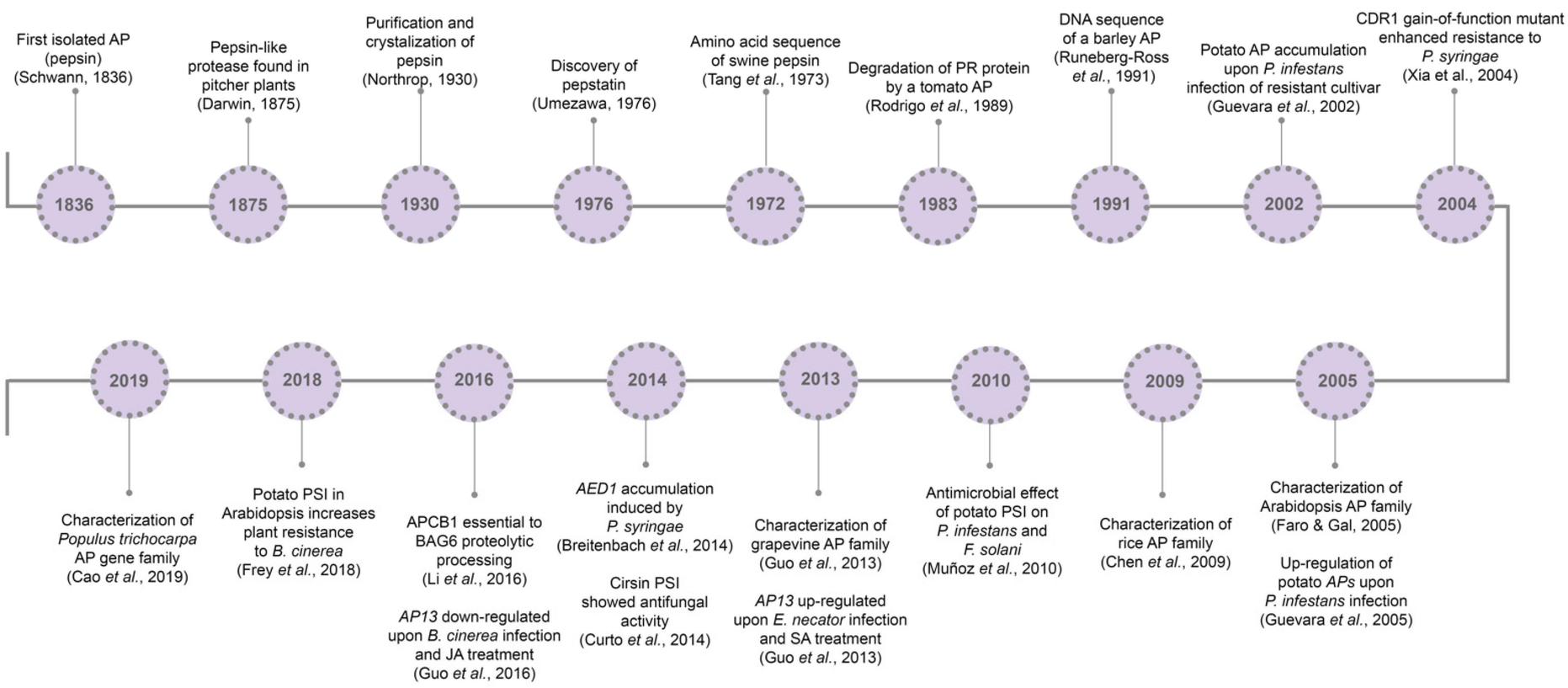

Figure 1. Aspartic proteases historical breakthroughs. AP, aspartic protease; CDR1, constitutive disease resistance 1; PSI, plant-specific insert; AP13, aspartic protease 13; SA, salicylic acid; AED1, apoplastic enhanced disease susceptibility 1; APCB1, aspartyl protease cleaving bcl-2 associated athanogene; BAG6, BCL-2 associated athanogene protein 6; SA, salicylic acid; JA, jasmonic acid; MeJA, methyl jasmonate.

Plant Aspartic Proteases VS Pathogenic Aspartic Proteases

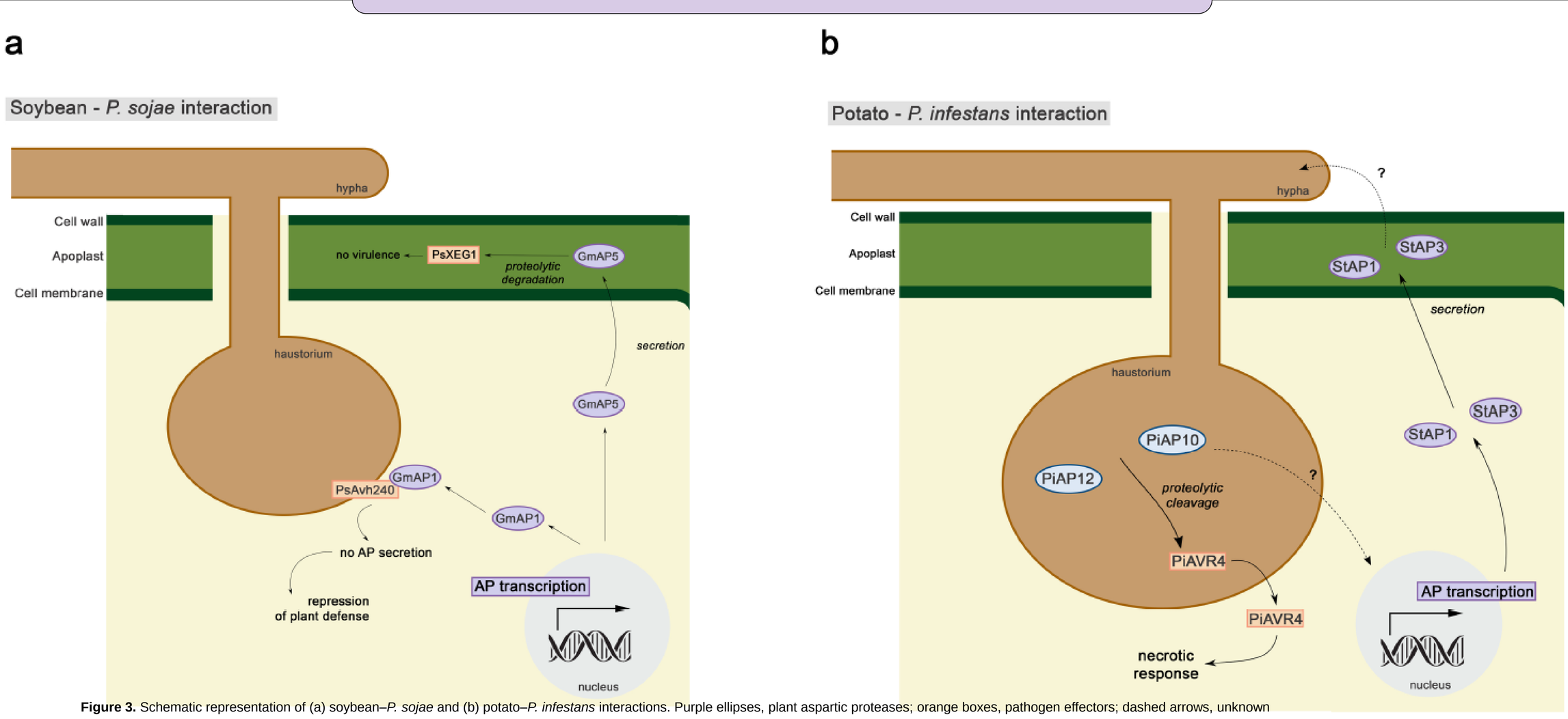

Figure 3. Schematic representation of (a) soybean–*P. sojae* and (b) potato–*P. infestans* interactions. Purple ellipses, plant aspartic proteases; orange boxes, pathogen effectors; dashed arrows, unknown processes.

Conclusions: The knowledge about plant–pathogen interaction has risen, as well as the involvement of aspartic proteases in this interaction. It is clear that APs have an important role in plant defense against a wide range of pathogens. On the other hand, aspartic proteases from pathogens are still poorly studied. Research within a variety of molecular, genetic, and biochemical approaches will contribute to fully address these questions and finally understand the regulation mechanisms regarding plant aspartic proteases role, particularly in plant development and pathogen interaction.

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References: Figueiredo, L.; Santos, R.B.; Figueiredo, A. Defense and Offense Strategies: The Role of Aspartic Proteases in Plant–Pathogen Interactions. *Biology* **2021**, 10, 75. https://doi.org/10.3390/biology10020075

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