Characterization of an antimicrobial peptide from eggplant leaves as an inhibitor of carboxypeptidase

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The constant use of antibiotics to control diseases resulted in the selection of resistant pathogens. Antimicrobial peptides (AMPs) represent a primitive defense mechanism of plants, still poorly understood, and represent sources of defense agents with new mechanisms of action and the advantage of being non-inducer of microbial resistance. Solanaceae such as peppers, eggplant, tomatoes and potatoes are promising as AMPs sources for biotechnological applications, which is the aim of our research group. An antimicrobial peptide was purified from leaves of eggplant (*Solanum melongena*) in the Laboratory of Proteomics and Protein Biochemistry at Federal University of Viçosa (Viçosa-MG). The peptide presented 4,140 Da and six cysteine residues linked by three disulfide bonds. The 30 first residues were sequenced by automatic Edman sequencing and showed no significant similarity to other peptides described in UniProtKB/Swiss-Prot, RefSeq and PDB (by BLASTp). In the Eggplant Database, which contains the complete genome of the eggplant, a sequence encoding 59 residues was identified showing identity with 28 of the 30 residues already obtained, which allowed completing the sequence of 37 residues of the eggplant peptide. ClustalOmega showed only two different residues in eggplant peptide when compared to the peptide of 59 residues (19Val-Ile and 21Gln-Trp). PSI-BLAST identified three peptides with high identity in the sequence, all obtained from Solanaceae: for Ref-Seq, a pepper (Capsicum annuum) peptide with 86 residues, and for NCBI and PDB, a tomato (*Solanum lycopersicum*) peptide (PDB- 2HLG) and a potato (*Solanum tuberosum*) peptide (PDB-1h20), both with 39 residues. JPred and PSIPRED showed an alpha-helical region (residues 16-27) and a beta structure (residues 31-35), similarly to the tomato and potato peptides. The tomato and potato peptides also contain three disulfide bonds with cysteine residues in equivalent positions to the eggplant peptide. Pfam indicated the presence of a carboxypeptidase inhibitor (CPI) domain, which is also present in tomato and potato peptides. Thus, the peptide of *S. melongena* was named CPI-SMEL. Molecular modeling of CPI-SMEL (37 residues) by similarity using PHYRE² indicated these tomato and potato peptides as molds, and was able to position two of the three disulfide bonds, missing the bind near to the C-terminus. The CPI activity will be determined in vitro to confirm the CPI-SMEL function, following studies aiming the use in biotechnology. (FAPEMIG, CNPq, CAPES, FINEP, NuBioMol, BIOAGRO).