



Figure S3 Construction and identification of the pCAMBIA1300-*GFP-StKHD-41* expression vector. (A) Schematic diagram of the pCAMBIA1300-*GFP-StKHD-41* expression vector construction; (B) Double restriction enzyme digestion analysis of the pCAMBIAsuper1300-*StKHD-41* recombinant vector. Lane 1: The digestion products, where the 2070 bp band corresponds to the target *StKHD-41* gene fragment.

M: Trans10kb® Plus DNA Marker ; (C) Sequencing Validation of pCAMBIA1300-*GFP-StKHD-41*. The pCAMBIA1300-*GFP-StKHD-41* were subjected to Sanger sequencing (Sangon Biotech, Shanghai, China) using vector-specific primers (forward primer: 5'-GCGTCGACATGGACAGATCAAGATC-3'; reverse primer: 5'-GGTACCGGGTCGACCTGAACAGAGA-3') for validation of the inserted fragment integrity. Sequencing quality was evaluated by Q30 score ( $\geq 80\%$  of bases with Q30  $\geq 30$ , indicating high sequence accuracy). Sequence alignment was conducted using DNAMAN 9.0 software to compare the insert sequence with the designed target sequence. The results confirmed that all recombinant vectors harbored the correct full-length target gene, with no nucleotide mismatches, deletions, insertions, or frame-shift mutations. The multiple cloning site and flanking regions of the vector were also verified to ensure no unintended modifications. The complete sequencing report including raw chromatograms, FASTA sequences, and alignment results, are provided as Fig S3-Supplementary File (PDF format, XG04551F ABX28476-1) for peer review and reproducibility.