

**Supplemental Table S2.** Cloning primers, vectors, strains and results of heterologous expressions of PAPHy in *E. coli* and *P. pastoris*. Bold in the primer sequences indicates restriction sites included for cloning purposes. Bold in the amino acid sequences indicates that the amino acids are included in the expression cassette.

Construct name	Primer_fw 5'→	Primer_rv 5'→	Vector/strain	Note	Protein Expression
TaPAPHy_b1 ( <i>E.coli</i> )	TaPAPHy_b1_NdeI GCG <b>CATATG</b> GAGCCGGCGTCGACGCTGGAG ( M E P A S T L G . . . )	TaPAPHy_b1_Hind_III CAGA <b>AAGCTT</b> TATCAAAGTATGCCGCT (... <b>S S I A A Y F</b> - stop)	pET15m Rosetta B pRARE 2 (Lys S)	Δ signal peptide N-HIS6, thrombin site	insoluble proteins used for production of polyclonal antibodies
TaPAPHy_a1 ( <i>Pichia</i> ) Full length	TaPAPHy_a1_Nde_I GCAC <b>ATATG</b> CTGGAGCCGGCGTCGACGCTC ( . . . H M L E P A S T L . . . )	TaPAPHy_a1_Xba_I TG <b>TTCTAG</b> ATTAACCTCCCGATTCCCGTGTGG ( . . . S N T T R E S G G - stop)	pPICZ-alpha-A(NdeI) pichia KM-71	Δ signal peptide	present in low amount in pichia cell surface
Δ C-terminal	TaPAPHy_a1_NdeI as above	TaPAPHy_a1_Delta_C-t_XbaI TG <b>TTCTAG</b> ATTAATGATGATGATGATGCTTGAGCAAGCACCT ( . . . <b>C L L K H H H H H H</b> -stop )	pPICZ-alpha-A(NdeI) pichia KM-71	Δ signal peptide ΔC-term, C-HIS6	<u>secreted</u> (2.5 mg/L)
TaPAPHy_b1 ( <i>Pichia</i> ) full length	TaPAPHy_b1_EcoRI_Nde_I GTAGA <b>ATTCGGACATATG</b> GAGCCGGCTTCGACGCTGGAG ( ... E F G H M E P A S T L G . . . )	TaPAPHy_b1_Sal_I ATG <b>GTCGAC</b> TCAAAGTATGCCGCT (... <b>C L L K S S I A A Y F</b> - stop)	pPICZ-alpha-A pichia KM-71	Δ signal peptide	not secreted
Δ C-terminal	TaPAPHy_b1_Nde_I GG <b>ACATATG</b> GAGCCGGCTTCGACGCTGGAG ( . . . H M E P A S T L G . . . )	TaPAPHy_b1_Delta_C-t_Xba_I TG <b>TTCTAG</b> ATTAATGATGATGATGATGATGTTTGAGCAGGCATCT ( . . . <b>C L L K H H H H H H</b> -stop )	pPICZ-alpha-A(NdeI) pichia KM-71	Δ signal peptide ΔC-term, C-HIS6	<u>secreted</u> (12-20mg/L)
HvPAPHy_a ( <i>Pichia</i> ) Δ C-terminal	HvPAPHy_a_Nde_I CGAT <b>CATATG</b> GAAACCGCTTCGACGCTCGCT ( . . . H M E P L S T L A . . . )	HvPAPHy_a_Delta_C-t_Sal_I ATG <b>GTCGAC</b> CTTGCAAGCACCTCTC ( . . . E R C L H K V D H H H H H H -stop)	pPICZ-alpha-A(NdeI) pichia KM-71	Δ signal peptide ΔC-term, C-HIS6	<u>secreted</u> (1.5 mg/L)
HvPAPHy_b2 ( <i>Pichia</i> ) Δ C-terminal	HvPAPHy_b2_Nde_I GCAT <b>GCATATG</b> GAGCCGGCGTCG ( . . . H M E P A S M L . . . )	HvPAPHy_b2_Delta_C-t_Xba_I TG <b>TTCTAG</b> ATTAATGATGATGATGATGATGTTTGAGCAGGCATCT ( . . . <b>C L L K H H H H H H</b> -stop )	pPICZ-alpha-A pichia KM-71	Δ signal peptide ΔC-term, C-HIS6	<u>secreted</u> (2.5 mg/L)
ZmPAPHy_b ( <i>Pichia</i> ) Δ C-terminal	ZmPAPHy_b_EcoRI_Nde_I GCTGA <b>ATTCGGACATATG</b> GAGCCGGCGTCGACGCT ( . . . F G H M E P A S T . . . )	ZmPAPHy_b_Delta_C-t_Xba_I TG <b>TTCTAG</b> ATTAATGATGATGATGATGCTTAAGGAGGCACTTGTCG ( . . . <b>C L L K H H H H H H</b> -stop )	pPICZ-alpha-A pichia KM-71	Δ signal peptide ΔC-term, C-HIS6	<u>secreted</u> (3.5 mg/L)
OsPAPHy_b ( <i>Pichia</i> ) Δ C-terminal	OsPAPHy_b_EcoRI_Nde_I CTGA <b>ATTCGGACATATG</b> GCTTCGTCGACGTT ( . . . E F G H M A P S S T . . . )	OsPAPHy_b_Delta_C-t_Xba_I TG <b>TTCTAG</b> ATTAATGATGATGATGATGTTTGATCAGGCACTTGTC ( . . . <b>C L I K H H H H H H</b> -stop )	pPICZ-alpha-A pichia KM-71	Δ signal peptide ΔC-term, C-HIS6	<u>secreted</u> (3.5 mg/L)

