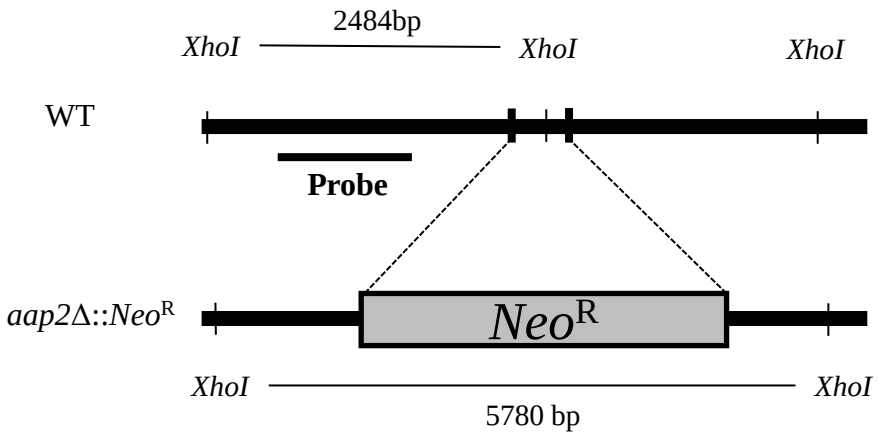
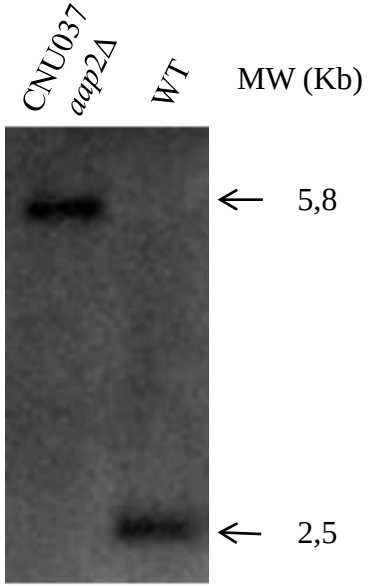
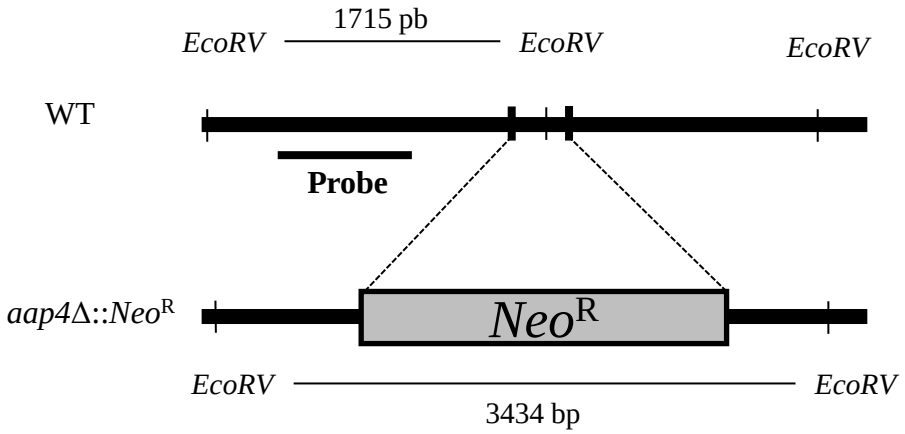
(A)

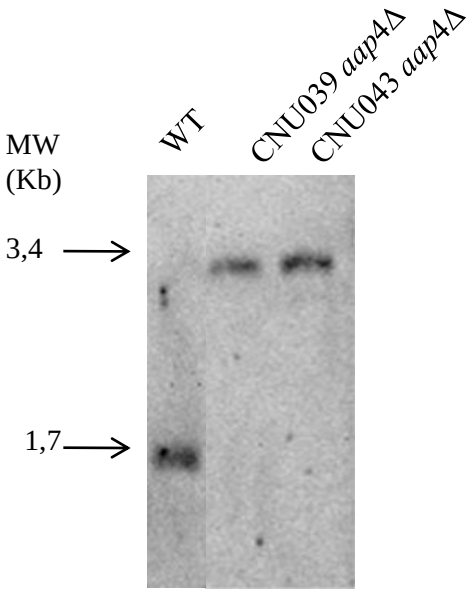




S1 Fig. Schematic representation of wild type and mutant loci and s*outhern blot* analysis of single and double mutants. **(A)** *aap*2Δ; (B) *aap*4Δ; (C) *aap*5Δ; (D*) aap*4Δ/*aap*5Δ; (E) *mup*1Δ; (F) *mup*3Δ and (G) *mup*1Δ /*mup*3Δ. MW = molecular weight; Kb = kilobase pairs

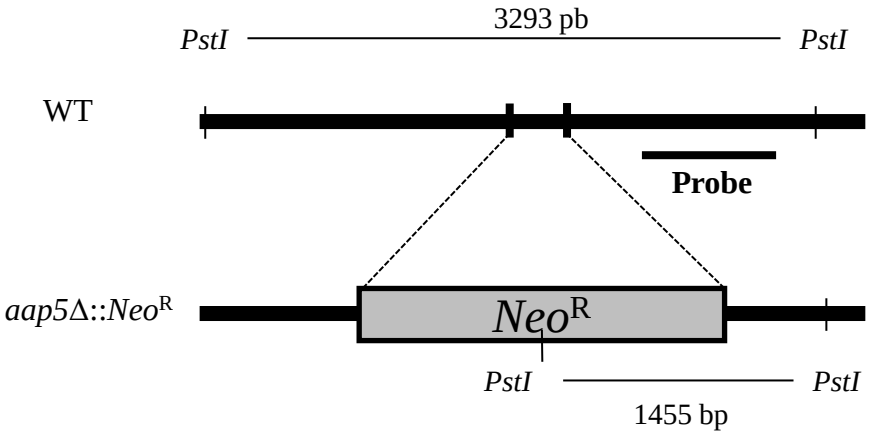
(B)

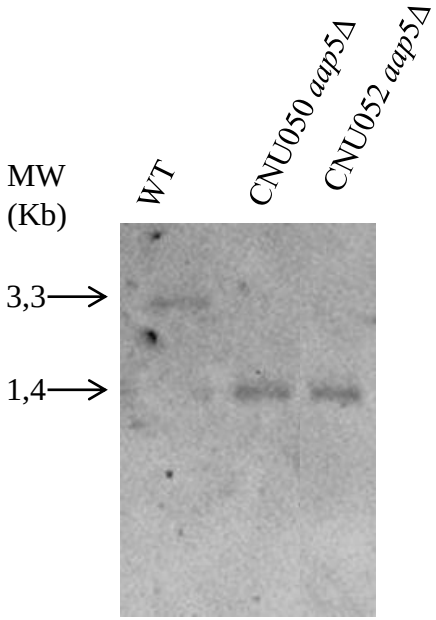




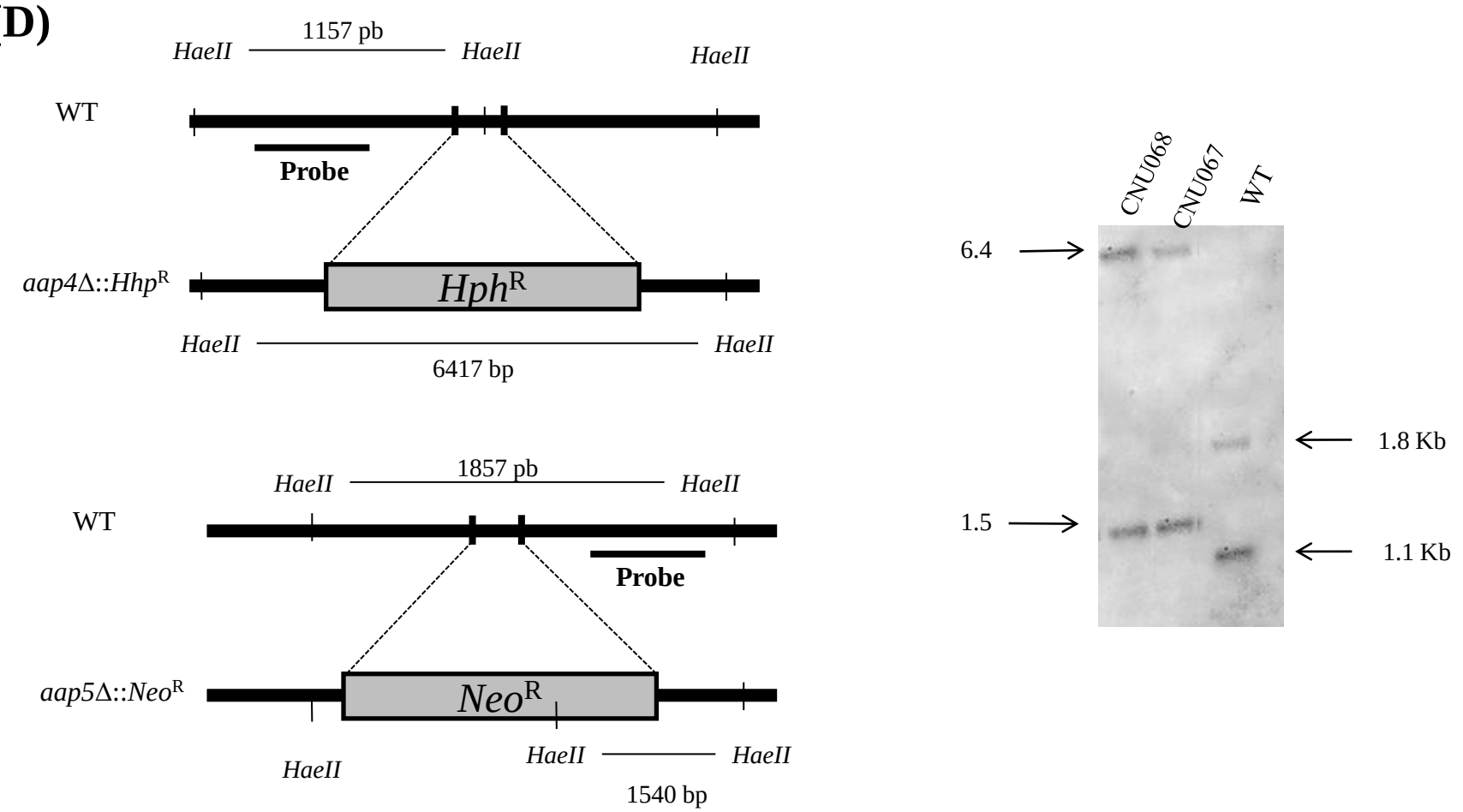
Supplementary Figure 1. S*outhern blot* analysis of *aap*4Δ::*Neo*^{R}. **(C)** Schematic representation of *AAP*4 *locus* with *EcoRV* sites. **(D)** Restriction pattern of *AAP4 locus* in the wild type (WT) H99 and mutant strains (CNU039 and 043). MW = molecular weight; Kb = kilobase pairs

(C)



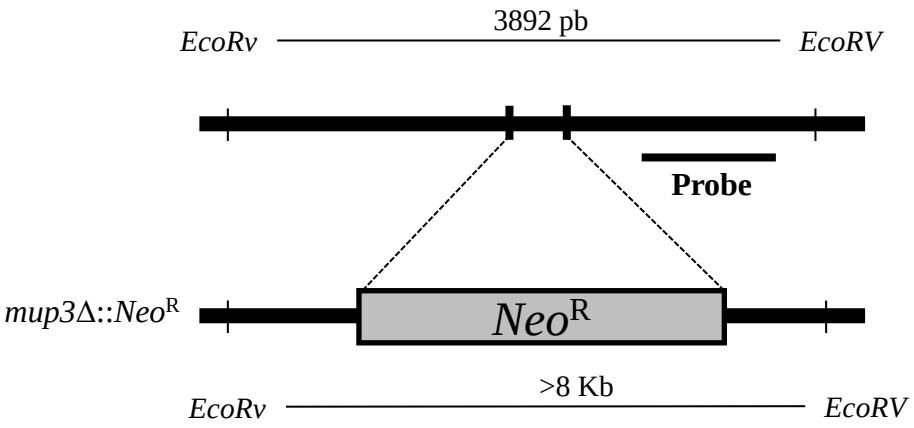


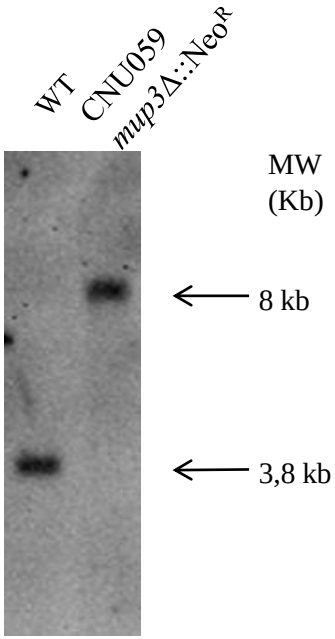
Supplementary Figure 1. S*outhern blot* analysis of *aap*5Δ::*Neo*^{R}. **(E)** Schematic representation of *AAP*5 *locus* with *PstI* sites. **(F)** Restriction pattern of *AAP5 locus* in the wild type (WT) H99 and mutant strains (CNU050 and 052). MW = molecular weight; Kb = kilobase pairs



Supplementary Figure 1. S*outhern blot* analysis of *aap4*Δ::*Hph*^{R}/*aap*5Δ::*Neo*^{R}. **(G)** Schematic representation of *AAP*4 and *AAP*5 *locus* with *HaeII* sites. **(H)** Restriction pattern of *AAP4 and AAP5 locus* in the wild type (WT) H99 and mutant strains (CNU067 and 068). MW = molecular weight; Kb = kilobase pairs

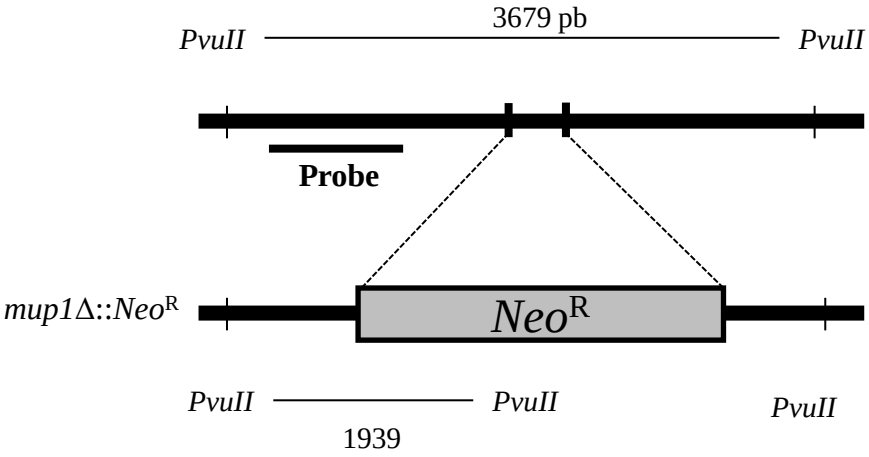
(E)

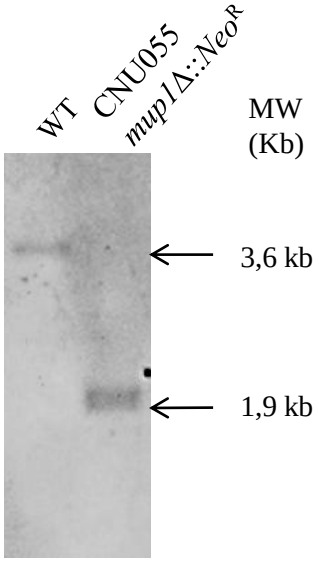




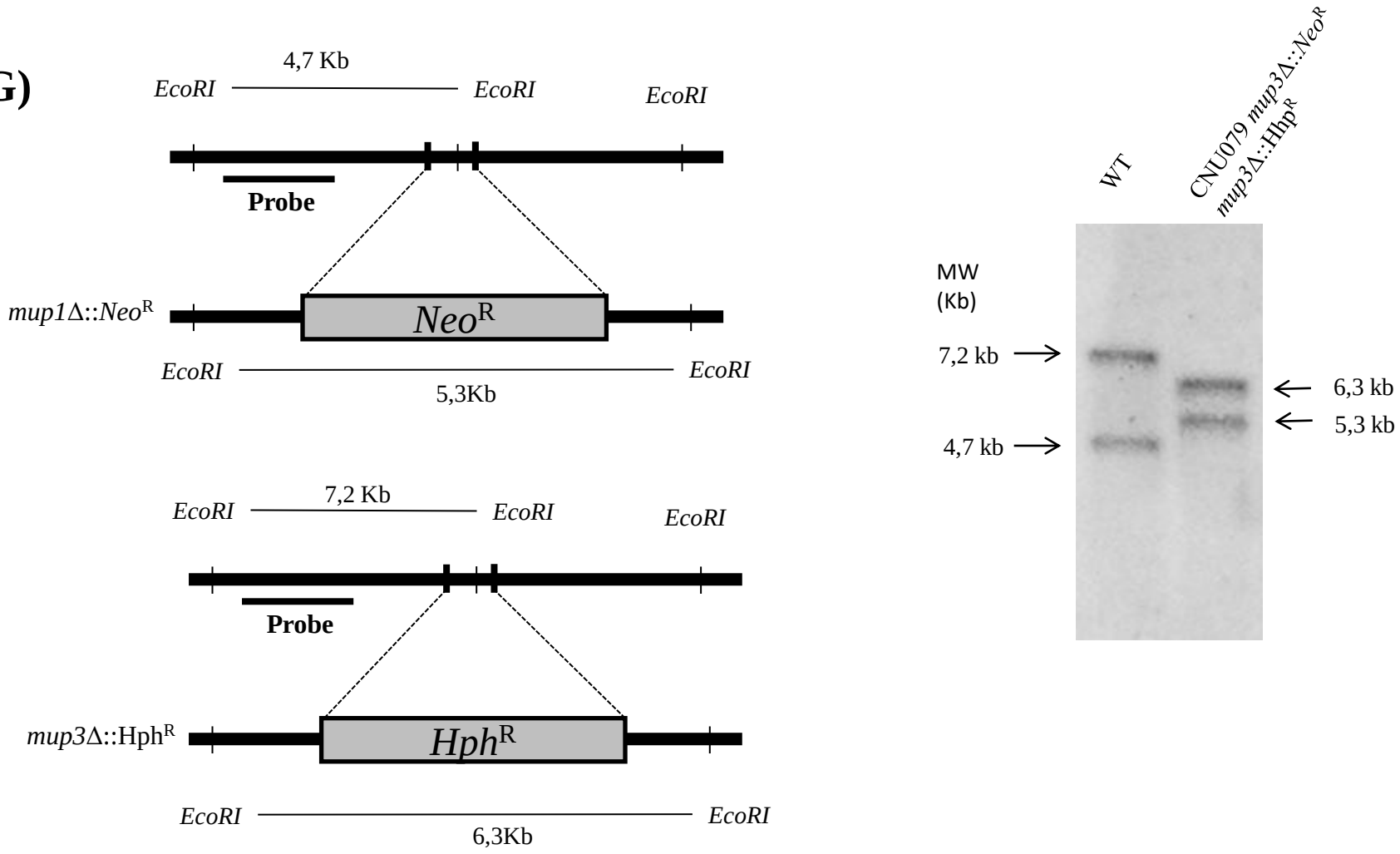
Supplementary Figure 1. S*outhern blot* analysis of *mup3*Δ::*Neo*^{R}. **(E)** Schematic representation of *MUP3 locus* with *EcoRV* sites. **(F)** Restriction pattern of *MUP3 locus* in the wild type (WT) H99 and mutant strain (CNU0059). MW = molecular weight; Kb = kilobase pairs

(F)





Supplementary Figure 1. S*outhern blot* analysis of *mup1*Δ::*Neo*^{R}. **(E)** Schematic representation of *MUP1 locus* with *PvuII* sites. **(F)** Restriction pattern of *MUP1 locus* in the wild type (WT) H99 and mutant strain (CNU0055). MW = molecular weight; Kb = kilobase pairs



Supplementary Figure 1. S*outhern blot* analysis of *mup1*Δ::*Neo*^{R}; *mup3*Δ::*Hhp*^{R}. **(M)** Schematic representation of *MUP1* and *MUP*3 *locus* with *EcoRI* sites. **(N)** Restriction pattern of *MUP1 and MUP3 locus* in the wild type (WT) H99 and mutant strain (CNU079). MW = molecular weight; Kb = kilobase pairs