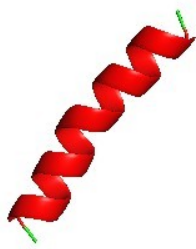
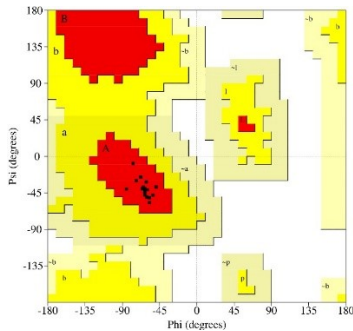
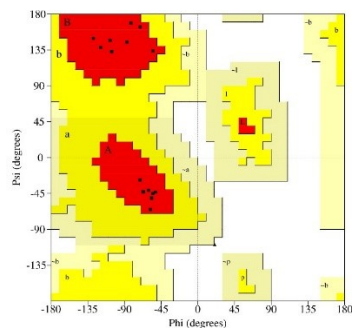
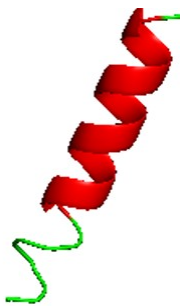
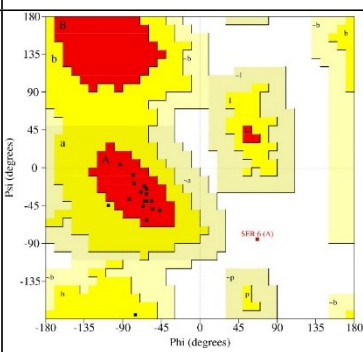
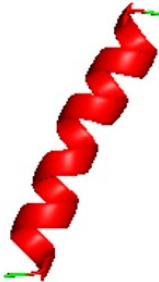
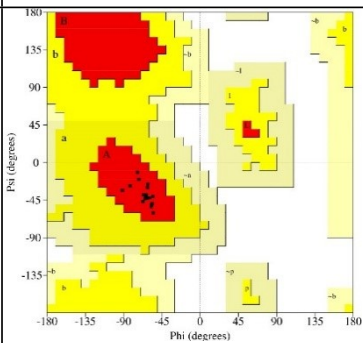


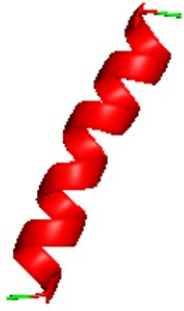
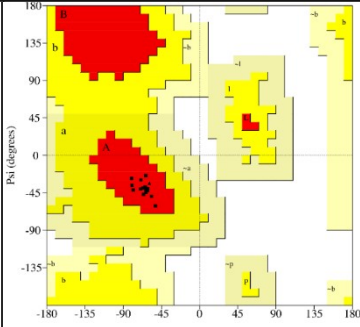
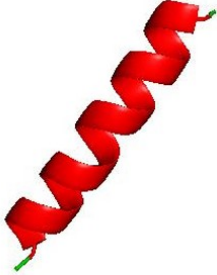
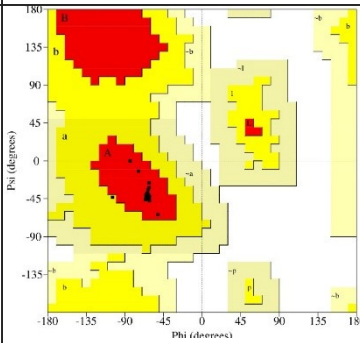
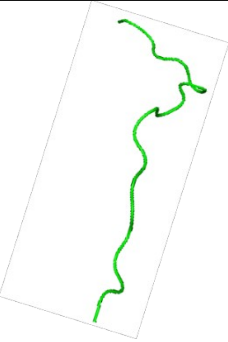
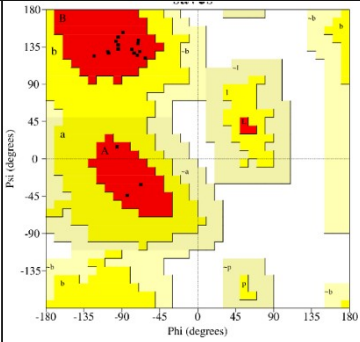
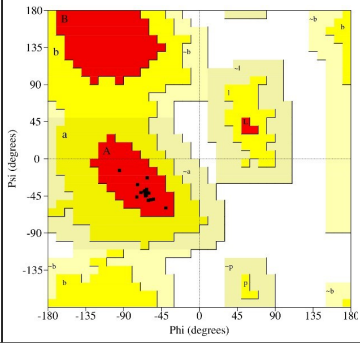
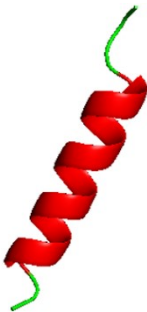
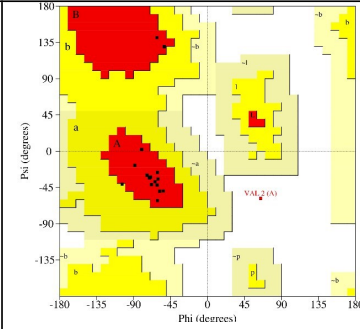
SUPPLEMENTARY MATERIALS

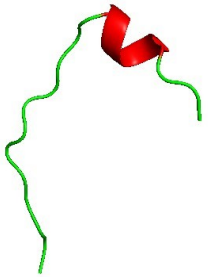
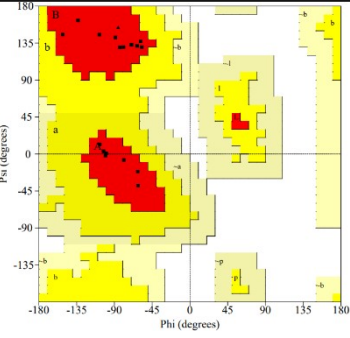
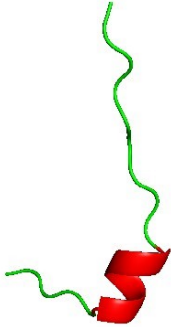
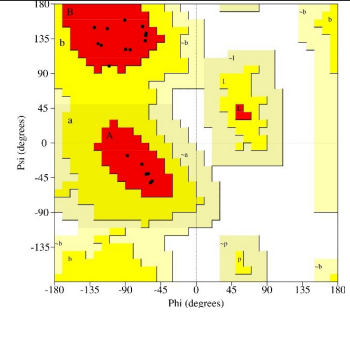
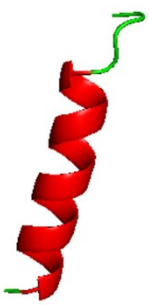
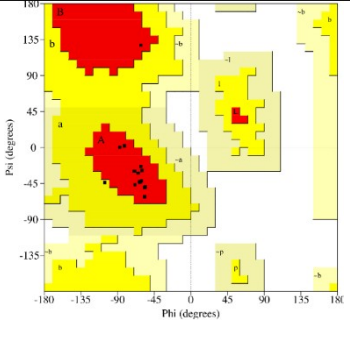
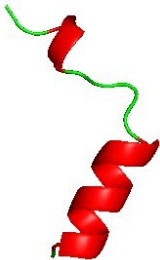
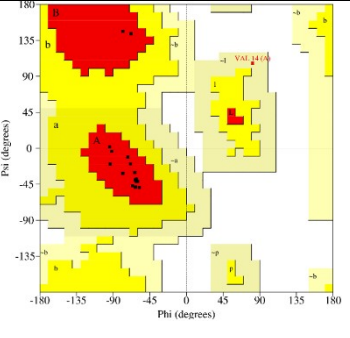
Table S1. NS1 DENV-2 gene data from diverse geographical regions across Indonesia

No	Strain Name	Geographic Origin	GenBank ID	FASTA	Year
1	SMG-SE001	Semarang	AHK09928.1	DSGCVSWKNKELKCGSGIFITDNVHTWTEQYKFQPEPSKLSAIAQKAHEEGICGIRSVTRLENLMWQ ITPELNHILSENEVKLTIMTGDIGIMQAGKRSRQPTELKYSWKAWGAKMLSTELHNHTFLIDGPET AECPTNRAWNSLEVEDYGFVFTTNIWLKLERQDVFCDSKLSAAIKDNRVHADMGYIESALNDTW KIEKASFIEVKSCHMPKSHTLWSNGVLESEMIIPKNFAGPVSQHNYRPGYHTQTAGPWLGRLEMDDFC EGTTVVVTEDCGNRGPRLRTTASGKLITEWCCRSCTLPPLRYRGEDGCWYGMEIRPLKEKEENLVNSLV TA	2012
2	JKT-J002	Jakarta	AHK09926.1	DSGCVSWKNKELKCGSGIFITDNVHTWTEQYKFQPEPSKLSAIAQKAHEEGICGIRSVTRLENLMWQ ITPELNHILSENEVKLTIMTGDIGIMQAGKRSRQPTELKYSWKAWGAKMLSTELHNHTFLIDGPET AECPTNRAWNSLEVEDYGFVFTTNIWLKLERQDVFCDSKLSAAIKDNRVHADMGYIESALNDTW KIEKASFIEVKSCHMPKSHTLWSNGVLESEMIIPKNFAGPVSQHNYRPGYHTQTAGPWLGRLEMDDFC EGTTVVVTEDCGNRGPRLRTTASGKLITEWCCRSCTLPPLRYRGEDGCWYGMEIRPLKEKEENLVNSLV TA	2010
3	JKT-J004	Jakarta	AHK09927.1	DSGCVSWKNKELKCGSGIFITDNVHTWTEQYKFQPEPSKLSAIAQKAHEEGICGIRSVTRLENLMWQ ITPELNHILSENEVKLTIMTGDIGIMQAGKRSRQPTELKYSWKAWGAKMLSTELHNHTFLIDGPET AECPTNRAWNSLEVEDYGFVFTTNIWLKLERQDVFCDSKLSAAIKDNRVHADMGYIESALNDTW KIEKASFIEVKSCHMPKSHTLWSNGVLESEMIIPKNFAGPVSQHNYRPGYHTQTAGPWLGRLEMDDFC EGTTVVVTEDCGNRGPRLRTTASGKLITEWCCRSCTLPPLRYRGEDGCWYGMEIRPLKEKEENLVNSLV TA	2010
4	MDN-M004	Medan	AHK09924.1	DSGCVSWKNKELKCGSGIFITDNVHTWTEQYKFQPEPSKLSAIAQKAHEEGICGIRSVTRLENLMWQ ITPELNHILTENEVKLTIMTGDIGIMQAGKRSRQPTELKYSWKAWGAKMLSTELHNHTFLIDGPET AECPTNRAWNSLEVEDYGFVFTTNIWLKLERQDVFCDSKLSAAIKDNRVHADMGYIESALNDTW KIEKASFIEVKSCHMPKSHTLWSNGVLESEMIIPKNFAGPVSQHNYRPGYHTQTAGPWLGRLEMDDFC EGTTVVVTEDCGNRGPRLRTTASGKLITEWCCRSCTLPPLRYRGEDGCWYGMEIRPLKEKEENLVNSLV TA	2010
5	MDN-M022	Medan	AHK09925.1	DSGCVSWKNKELKCGSGIFITDNVHTWTEQYKFQPEPSKLSAIAQKAHEEGICGIRSVTRLENLMWQ ITPELNHILTENEVKLTIMTGDIGIMQAGKRSRQPTELKYSWKAWGAKMLSTELHNHTFLIDGPET AECPTNRAWNSLEVEDYGFVFTTNIWLKLERQDVFCDSKLSAAIKDNRVHADMGYIESALNDTW KIEKASFIEVKSCHMPKSHTLWSNGVLESEMIIPKNFAGPVSQHNYRPGYHTQTAGPWLGRLEMDDFC EGTTVVVTEDCGNRGPRLRTTASGKLITEWCCRSCTLPPLRYRGEDGCWYGMEIRPLKEKEENLVNSLV TA	2010
6	SUB-0011	Surabaya	AHK09923.1	DSGCVSWKNKELKCGSGIFITDNVHTWTEQYKFQPEPSKLSAIAQKAHEEGICGIRSVTRLENLMWQ ITPELNHILSENEVKLTIMTGDIGIMQAGKRSRQPTELKYSWKAWGAKMLSTELHNHTFLIDGPET AECPTNRAWNSLEVEDYGFVFTTNIWLKLERQDVFCDSKLSAAIKDNRVHADMGYIESALNDTW KIEKASFIEVKSCHMPKSHTLWSNGVLESEMIIPKNFAGPVSQHNYRPGYHTQTAGPWLGRLEMDDFC EGTTVVVTEDCGNRGPRLRTTASGKLITEWCCRSCTLPPLRYRGEDGCWYGMEIRPLKEKEENLVNSLV TA	2010

Table S2. 3D structural modeling of peptide mutants and ramachandran plot analysis

Peptide	3D structure	Ramachandran Plot
Mut 1		
Mut 2		
Mut 3		
Mut 4		

Mut 5		
Mut 6 (Mut 1 + Mut 2)		
Mut 7 (Mut1+ Mut4)		
Mut 8 (Mut1+ Mut5)		
Mut 9 (Mut2+ Mut3)		

Mut 10 (Mut2+ Mut5)	 Ribbon diagram of the protein structure for Mut 10 (Mut2+Mut5). The structure shows a green loop and a red helix.	 Ramachandran plot for Mut 10. The x-axis is Phi (degrees) from -180 to 180, and the y-axis is Psi (degrees) from -135 to 180. The plot shows a high density of points in the red region (allowed regions) and a lower density in the yellow region (disallowed regions).
Mut 11 (Mut3+ Mut4)	 Ribbon diagram of the protein structure for Mut 11 (Mut3+Mut4). The structure shows a green loop and a red helix.	 Ramachandran plot for Mut 11. The x-axis is Phi (degrees) from -180 to 180, and the y-axis is Psi (degrees) from -135 to 180. The plot shows a high density of points in the red region (allowed regions) and a lower density in the yellow region (disallowed regions).
Mut 12 (Mut3+ Mut5)	 Ribbon diagram of the protein structure for Mut 12 (Mut3+Mut5). The structure shows a green loop and a red helix.	 Ramachandran plot for Mut 12. The x-axis is Phi (degrees) from -180 to 180, and the y-axis is Psi (degrees) from -135 to 180. The plot shows a high density of points in the red region (allowed regions) and a lower density in the yellow region (disallowed regions).
Mut 13 (Mut4+ Mut5)	 Ribbon diagram of the protein structure for Mut 13 (Mut4+Mut5). The structure shows a green loop and a red helix.	 Ramachandran plot for Mut 13. The x-axis is Phi (degrees) from -180 to 180, and the y-axis is Psi (degrees) from -135 to 180. The plot shows a high density of points in the red region (allowed regions) and a lower density in the yellow region (disallowed regions). A specific point is labeled 'V51 34 (b)'.

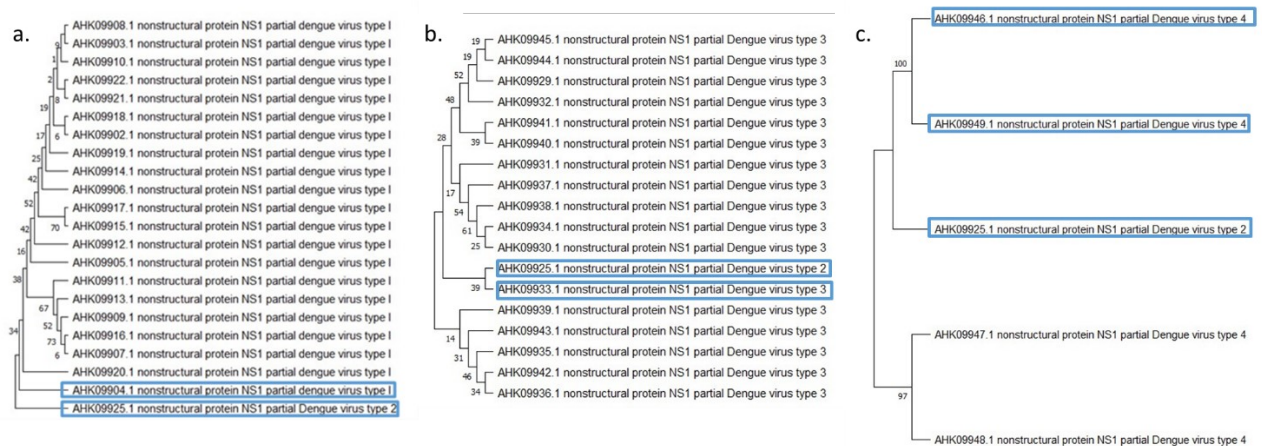


Figure S1. Phylogenetic trees of Indonesian dengue virus NS1 protein sequences.(a) DENV-1, (b) DENV-3, and (c) DENV-4.Sequences highlighted in blue were selected for specificity testing based on their close phylogenetic relationship to the DENV-2 NS1 reference sequence (AHK09925.1).

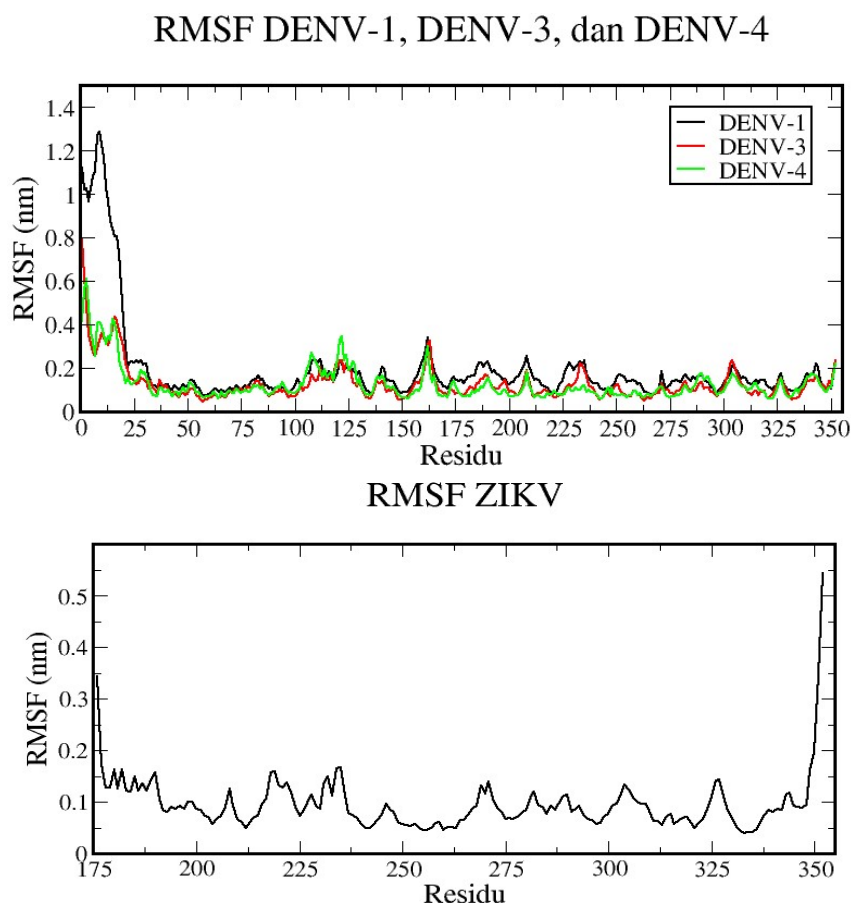
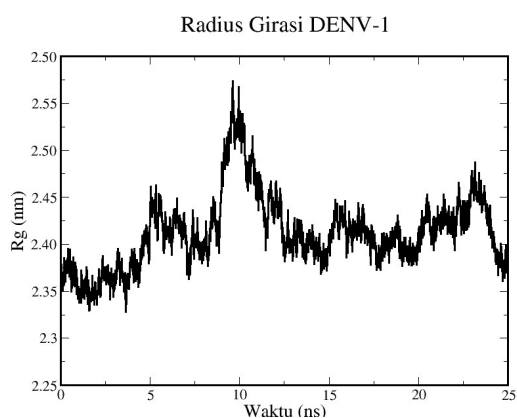


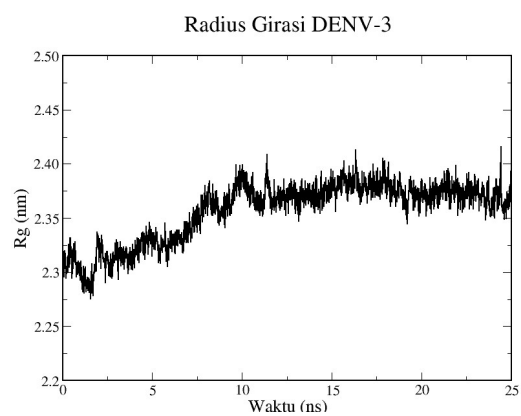
Figure S2. RMSF of peptide Mut-11 in complex with NS1 proteins of DENV-1, DENV-3, DENV-4, and ZIKV.

Table S3. Total Interactions of Peptides with DENV and ZIKV during MD Simulations

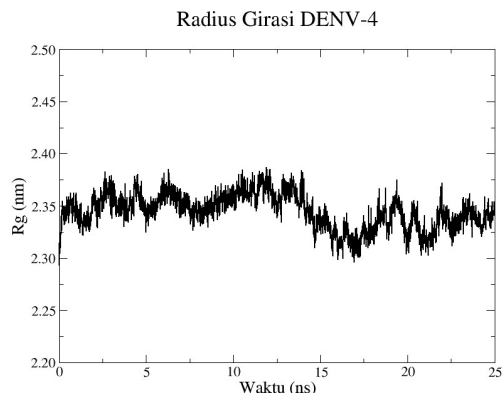
Simulation time (ns)	H-Bonds	Salt Bridges	Non-Bonded Contacts
DENV-1			
Initial (t = 0)	9	1	102
middle (t = 12.5)	-	-	2
Final (t = 25)	-	2	38
DENV-2			
Initial (t = 0)	8	-	88
middle (t = 12.5)	4	-	45
Final (t = 25)	5	1	46
DENV-3			
Initial (t = 0)	7	1	87
middle (t = 12.5)	4	-	85
Final (t = 25)	7	-	90
DENV-4			
Initial (t = 0)	8	1	87
middle (t = 12.5)	8	-	85
Final (t = 25)	7	-	90
ZIKV			
Initial (t = 0)	8	1	74
middle (t = 12.5)	6	2	41
Final (t = 25)	4	1	41



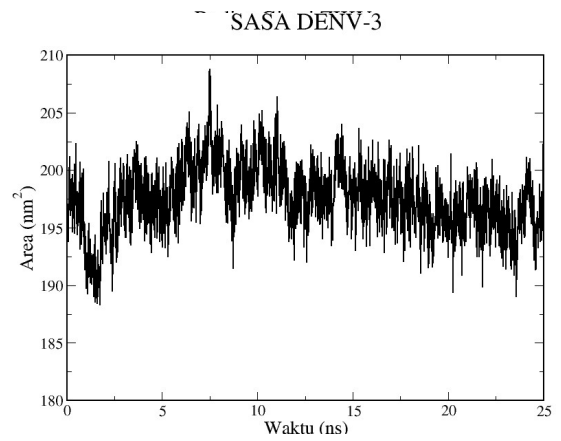
(a)



(b)

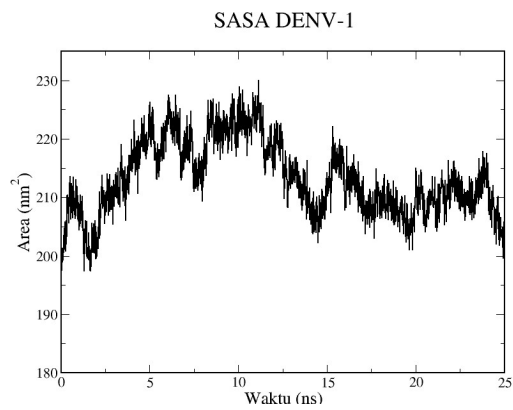


(c)

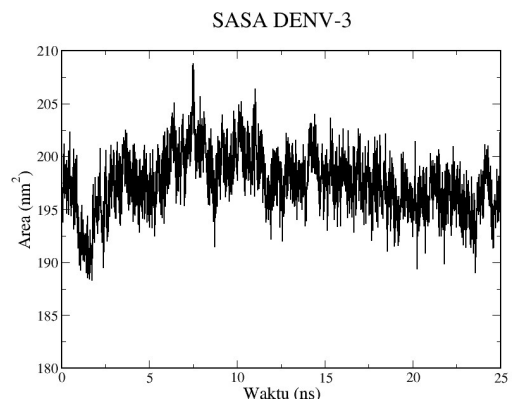


(d)

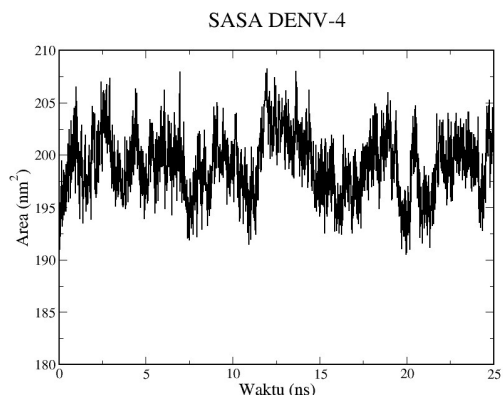
Figure S3. Radius of gyration (Rg) profiles of Mut-11 peptide in complex with NS1 proteins from different flaviviruses during 25 ns molecular dynamics (MD) simulations. (a) Rg of Mut-11–DENV-1 complex; (b) Rg of Mut-11–DENV-3 complex; (c) Rg of Mut-11–DENV-4 complex; and (d) Rg of Mut-11–ZIKV complex.



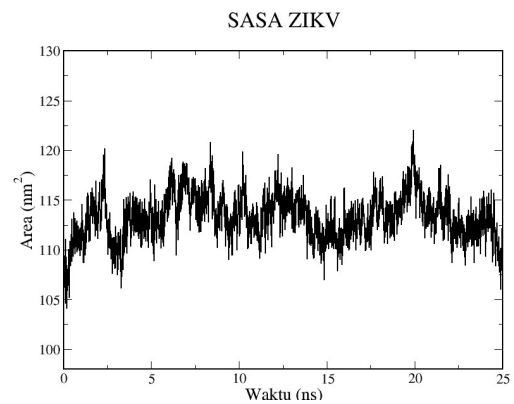
(a)



(b)



(c)



(d)

Figure S4. Radius of gyration (Rg) profiles of Mut-11 peptide in complex with NS1 proteins from different flaviviruses during 25 ns molecular dynamics (MD) simulations. (a) Rg of Mut-11–DENV-1 complex; (b) Rg of Mut-11–DENV-3 complex; (c) Rg of Mut-11–DENV-4 complex; and (d) Rg of Mut-11–ZIKV complex.

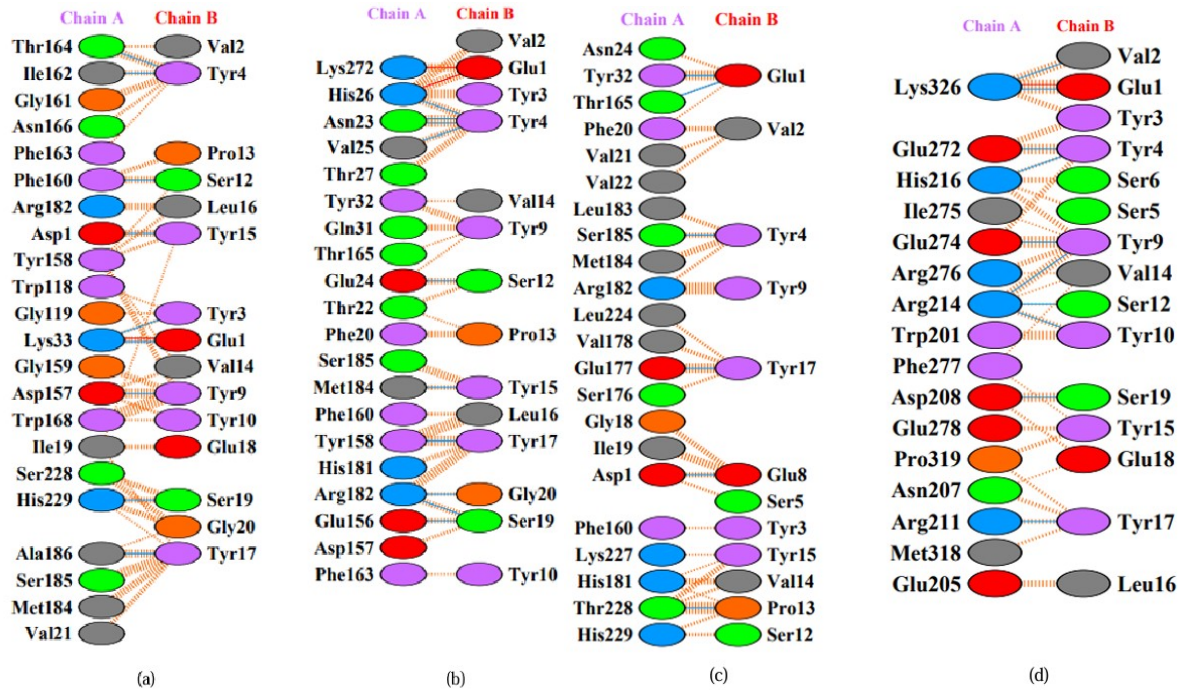


Figure S5. Molecular Interaction Profiles of Peptide Mutants (Chain B) with (a) DENV-1, (b) DENV-3, (c) DENV-4, (d) ZIKV