

Supplementary Material

Evolutionary dynamics of canine kobuvirus in Vietnam and Thailand reveal the evidence of viral ability to evade host immunity.

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Supplementary Table 1 List of primers used for detection^a and amplification^b the 7 regions of canine kobuvirus (CaKoV) genome.

Direction	Sequence (5'-3')	Genome position	Product size (bp)
Primers for CaKoV detection			
Forward	CATCCAYTCCATCCGCCATT	6917 - 7354	438
Reverse	AAATCTCCRTCACGCARCCA		
Primers for amplification the 7 regions of CaKoV genome			
Forward	GTGTCCAYTCTAATACCCCGAG	625 - 2030	1406
Reverse	GGGTRTTGTACATGGCAGC		
Forward	CACGGTCACYTGGGARCA	1087 - 3038	1232
Reverse	GGACGTTRAAGGAYTCGCC		
Forward	GTGGACATCTTCAAYCCTGAT	2894 - 4163	1270
Reverse	CCAATGAGAAGCCGGTGTT		
Forward	TGTCTACATCGTYCGTGCAG	3877 - 5289	1413
Reverse	ATGTCGTCGATGAAGTGGAC		
Forward	CATGATGCATTACTCGGATTCC	4894 - 6199	1306
Reverse	GTAGAATCCRGACATGACRGC		
Forward	CTGGAAACCATAACCAACACC	5876 - 7134	1259
Reverse	TAATCCGGATCYTCAAGYGTG		
Forward	CGACACCCAACCTCTTYCTCA	6832 - 8210	1379
Reverse	TACRACCATGGCTTAGGGG		

^a Primers were designed based on the available CaKoV sequence JQ911763.

^b Primers were designed based on the available CaKoV sequence MK201777.

Supplementary Table 2 Co-detection of canine kobuvirus (CaKoV) with other common enteric viruses.

Co-detection scenario^a	Vietnam (%)	Thailand (%)
Single CaKoV detection	7/33 (21.2%)	9/17 (52.9%)
Co-detection with CPV	9/33 (27.3%)	0/17 (0%)
Co-detection with CDV	0/33 (0%)	0/17 (0%)
Co-detection with CCoV	2/33 (6.06%)	2/17 (11.8%)
Co-detection with CaAstV	4/33 (12.1%)	6/17 (35.3%)
Co-detection with CPV, CCoV	0/33 (0%)	0/17 (0%)
Co-detection with CPV, CaAstV	6/33 (18.2%)	0/17 (0%)
Co-detection with CDV, CCoV	2/33 (6.1%)	0/17 (0%)
Co-detection with CDV, CaAstV	1/33 (3%)	0/17 (0%)
Co-detection with CPV, CCoV, CaAstV	1/33 (3%)	0/17 (0%)
Co-detection with CPV, CDV, CCoV, CaAstV	1/33 (3%)	0/17 (0%)

^a canine parvovirus (CPV), canine distemper virus (CDV), canine coronavirus (CCoV), canine astrovirus (CaAstV)

Supplementary Table 3 Information of Thai and Vietnamese canine kobuvirus (CaKoV) strains obtained from this study.

Dog no.	Time of collection	City, Country^a	Sex^b	Age (month)	Breed	Clinical signs	Housing	Vaccination history	Deworming	Interact with other pets	GenBank Accession number
G50	Sep 2021	BKK, TH	F	3	Chihuahua	Diarrhea	Indoor	Yes	Yes	No	PP320358
S76	Sep 2021	BKK, TH	M	3	Yorkshire	Healthy	Indoor	Yes	Yes	Dogs	PP320359
S81	Sep 2021	BKK, TH	M	3	Yorkshire	Healthy	Indoor	Yes	Yes	Dogs	PP320360
F8	Feb 2022	NST, TH	M	30	Pomeranian	Healthy	Indoor	Yes	Yes	No	PP320361
V5	Apr 2022	HCM, VN	M	1	Mixed	Diarrhea	Indoor	No	Yes	Dogs	PP320362
V25	Apr 2022	HCM, VN	F	3	Vietnam Local	Diarrhea	Indoor, outdoor	No	Yes	Dogs	PP320363
V91	Apr 2022	HCM, VN	M	2	Vietnam Local	Diarrhea	Indoor, outdoor	No	No	Dogs, Cats	PP320364
V156	Apr 2022	HCM, VN	M	1	Poodle	Diarrhea	Indoor	No	No	Dogs	PP320365
V162	Apr 2022	HCM, VN	F	3	Mixed	Diarrhea	Indoor	No	Yes	Dogs	PP320366
V178	Apr 2022	HCM, VN	M	18	Vietnam Local	Diarrhea	Indoor, outdoor	No	No	No	PP320367
V180	Apr 2022	HCM, VN	F	1	Papillon	Diarrhea	Indoor	Yes	Yes	Dogs	PP320368
V194	Apr 2022	HCM, VN	M	2	Mixed	Healthy	Indoor, outdoor	Yes	Yes	Dogs	PP320369
V196	Apr 2022	HCM, VN	M	2	Mixed	Diarrhea	Indoor, outdoor	No	No	Dogs, Cats	PP320370

^a BKK, TH (Bangkok, Thailand); NST, TH (Nakhon Si Thammarat, Thailand); HCM, VN (Ho Chi Minh city, Vietnam)

^b M (Male); F (Female)

Supplementary Table 4 Similarity percentage of nucleotide (nt) and amino acid (aa) of Vietnamese and Thai canine kobuvirus (CaKoV) and other deposited sequences.

CaKoV genome		Within Vietnamese CaKoV sequences	Within Thai CaKoV sequences	Between Vietnamese and Thai CaKoV sequences	Between Vietnamese CaKoV sequences and others	Between Thai CaKoV sequences and others
The CDS	nt	95-97.3%	96.3-99.9%	94.6-96.5%	83.4-89.6%	83.5-95.2%
	aa	92-96.4%	93.6-99.9%	91.9-95%	79.6-94%	79.7-93.6%
P1 region	nt	92.2-96.7%	94.1-99.9%	92.3-95.7%	88.1-96.8%	88.3-95.9%
	aa	85-93.3%	88.2-91.9%	84.8-92.5%	78-94.1%	79.4-92%
VP1 gene	nt	86.2-97.6%	91.7-94.7%	86.8-95.4%	81.6-96.5%	82.1-96%
	aa	89.3-99.6%	95-100%	87.9-97.8%	80-97.8%	81.1-98.5%
P2 region	nt	95.6-98.5%	96.5-100%	95.9-97.8%	93-97.7%	93.5-98.3%
	aa	99.6-100%	100%	99.8-100%	98.5-100%	98.6 -100%
P3 region	nt	96.2-98%	96.1-100%	95.7-97%	94-98.2%	93.7-97.2%
	aa	98.5-99.8%	99.2-100%	98.8-99.7%	97.8-100%	98-99.7%
3D gene	nt	96.7-98.3%	96.7-100%	96.2-97.6%	94-98.7%	93.8-98.3%
	aa	99.2-100%	99.6-100%	99.2-100%	98.1-100%	98.1-100%

Supplementary Table 5 The putative cleavage sites of canine kobuvirus (CaKoV).

Sequences	Accession number	Gene (Amino acid position)									
		L/VP0	VP0/VP3	VP3/VP1	VP1/2A	2A/2B	2B/2C	2C/3A	3A/3B	3B/3C	3C/3D
		(171/172)	(553/554)	(776/777)	(1054/1055)	(1165/1166)	(1330/1331)	(1665/1666)	(1759/1760)	(1786/1787)	(2176/2177)
V25/Vietnam/2022	PP320363 (This study)	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
V178/Vietnam/2022	PP320367 (This study)	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
V180/Vietnam/2022	PP320368 (This study)	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
V5/Vietnam/2022	PP320362 (This study)	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
V194/Vietnam/2022	PP320369 (This study)	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
V91/Vietnam/2022	PP320364 (This study)	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
V156/Vietnam/2022	PP320365 (This study)	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
V162/Vietnam/2022	PP320366 (This study)	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
V196/Vietnam/2022	PP320370 (This study)	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
F8/Thailand/2022	PP320361 (This study)	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
S76/Thailand/2021	PP320359 (This study)	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
S81/Thailand/2021	PP320360 (This study)	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
G50/Thailand/2021	PP320358 (This study)	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
DD2/Tanzania/2003	KM068048.1	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
UK003/UK/2008	KC161964.1	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
82/Tanzania/2010	KM068049.1	Q/G	Q/H	Q/T	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
B103/Tanzania/2010	KM068051.1	Q/G	Q/H	Q/T	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
US-PC0082/USA/2010	JN088541.1	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
75/Tanzania/2011	KM068050.1	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
12D049/Korea/2012	KF924623.1	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
CE9/Australia/2012	MH052678.1	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
SMCD-59/China/2015	MF062158.1	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
CaKoV-26/Brazil/2016	MH747478.1	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
S272/16/Fox/Germany/2016	MN337880.1	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
CU 53/Thailand/2016	MK201776.1	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
CU 101/Thailand/2016	MK201777.1	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
CU 249/Thailand/2017	MK201778.1	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
CU 716/Thailand/2018	MK201779.1	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G
JX-MO1/China/2021	OM451182.1	Q/G	Q/H	Q/A	Y/V	Q/G	Q/G	Q/G	Q/A	Q/G	Q/G

Supplementary Table 6 Genetic analysis VP1 gene of Vietnamese and Thai canine kobuvirus (CaKoV) compared with reference CaKoVs.

Name of sequence	Accession number	Country	Year	Position of amino acids																								
				60	65	67	69	150	151	153	201	204	205	210	213	228	229	230	231	232	233	234	235	236	237	238	239	240
V25/Vietnam/2022	PP320363 (This study)	Vietnam	2022	Q	V	D	T	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P
V178/Vietnam/2022	PP320367 (This study)	Vietnam	2022	Q	V	D	T	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P
V180/Vietnam/2022	PP320368 (This study)	Vietnam	2022	Q	V	D	T	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P
V5/Vietnam/2022	PP320362 (This study)	Vietnam	2022	Q	V	D	T	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P
V194/Vietnam/2022	PP320369 (This study)	Vietnam	2022	Q	V	D	T	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P
V91/Vietnam/2022	PP320364 (This study)	Vietnam	2022	Q	V	D	T	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P
V156/Vietnam/2022	PP320365 (This study)	Vietnam	2022	Q	V	D	T	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P
V162/Vietnam/2022	PP320366 (This study)	Vietnam	2022	N	L	N	A	S	E	N	T	V	E	S	S	P	R	A	P	P	P	L	P	P	L	P	T	P
V196/Vietnam/2022	PP320370 (This study)	Vietnam	2022	N	L	N	A	S	E	N	T	V	E	S	S	P	R	A	P	P	P	L	P	P	L	P	T	P
F8/Thailand/2022	PP320361 (This study)	Thailand	2022	Q	V	D	T	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P
S76/Thailand/2021	PP320359 (This study)	Thailand	2021	Q	V	D	T	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P
S81/Thailand/2021	PP320360 (This study)	Thailand	2021	Q	V	D	T	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P
G50/Thailand/2021	PP320358 (This study)	Thailand	2021	Q	V	D	T	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P
DD2/Tanzania/2003	KM068048.1	Tanzania	2003	N	L	N	A	S	E	N	T	V	E	S	S	P	R	A	P	P	P	L	P	P	L	P	T	P
UK003/UK/2008	KC161964.1	UK	2008	N	L	N	T	S	E	N	T	V	E	S	S	P	R	A	P	P	P	L	P	P	L	P	T	P
AN211D/USA/2009	JN387133.1	USA	2009	N	L	N	A	S	E	N	T	V	E	S	S	P	R	A	P	P	-	L	P	P	L	P	T	P
82/Tanzania/2010	KM068049.1	Tanzania	2010	N	L	N	A	S	E	N	T	A	E	S	S	C	P	V	P	P	P	L	P	P	L	P	T	P
B103/Tanzania/2010	KM068051.1	Tanzania	2010	N	L	N	A	S	E	N	T	A	E	S	S	P	R	A	P	P	P	L	P	P	L	P	T	P
US-PC0082/USA/2010	JN088541.1	USA	2010	N	L	N	T	S	E	N	T	V	E	S	S	C	P	V	P	P	P	L	P	P	L	P	T	P
75/Tanzania/2011	KM068050.1	Tanzania	2011	N	L	N	A	S	E	N	T	A	E	S	S	C	P	V	P	P	P	L	P	P	L	P	T	P
12D049/Korea/2012	KF924623.1	Korea	2012	N	L	N	T	S	E	N	T	V	E	S	S	P	R	A	P	P	P	L	P	P	L	P	T	P
CE9/Australia/2012	MH052678.1	Australia	2012	N	L	N	A	S	E	N	T	V	E	S	S	P	R	A	P	P	P	L	P	P	L	P	T	P
SMCD-59/China/2015	MF062158.1	China	2015	Q	V	D	A	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P
CaKoV-26/Brazil/2016	MH747478.1	Brazil	2016	N	L	N	A	S	E	N	T	V	E	S	S	H	G	A	P	P	P	L	P	P	L	P	T	P
S272/16/Fox/Germany/2016	MN337880.1	Germany	2016	N	L	N	T	S	E	N	T	V	E	S	S	P	R	A	P	P	P	L	P	P	L	P	T	P
CU 53/Thailand/2016	MK201776.1	Thailand	2016	Q	V	D	T	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P
CU 101/Thailand/2016	MK201777.1	Thailand	2016	Q	V	D	T	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P
CU 249/Thailand/2017	MK201778.1	Thailand	2017	Q	V	D	A	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P
CU 716/Thailand/2018	MK201779.1	Thailand	2018	Q	V	D	T	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P
CaKoV AH-1/China/2019	MN449341.1	China	2019	Q	V	D	T	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P
JX-MO1/China/2021	OM451182.1	China	2021	Q	V	N	T	P	M	D	S	Q	Q	Q	T	P	R	A	P	P	P	L	P	P	L	P	T	P

Supplementary Table 7 Setting parameters of methods to predict continuous B-cell epitope of VP1 capsid gene of canine kobuvirus (CaKoV) from IEDB database.

Method	Average score	Maximum score	Minimum score	Threshold
Kolaskar and Tongaonkar antigenicity	1.026	1.167	0.883	1.026
Bepipred linear epitope prediction	0.474	0.642	0.279	0.5
Parker hydrophilicity	1.353	6.586	-5.129	1.353
Emini surface accessibility	1.000	4.488	0.107	1.000
Chou and Fasman beta turn	1.047	1.391	0.648	1.047
Karplus and Schulz flexibility prediction	1.005	1.105	0.897	1.005

Supplementary Table 8 Information analysis of discontinuous B-cell epitope predicted from the VP1 capsid of Vietnamese and Thai canine kobuvirus (CaKoV) in this study.

No.	Residues	Number of residues	Score
1	A1, N2, S3, E4, D5, L6, N7, A8, P9, Q10, D11, T12, A13, N14, I15, E16, N17, G18, A19, S20, D21, N22, T23, P24, Q25, P26, R27, T28, T29, F30, E31, Y32	32	0.848
2	L234, P235, L237, E241, T242, N243, P244, E245, K246, S247, V248, A249, V250, V251, K252, Q253, G254, A255, H256, T257, S258, L259, G260, D261, V262, D263, P264, D265, D266, R267, V268, Y269, I270, V271, R272, D274	36	0.685
3	I109, S110, N111, P112, N113, G114, L115, P116, T117, S118, E146, T147, P148, I149, P150, M151, S152, D153, T154, T155, L156, S201, Y202, P203, Q204, T213	26	0.677
4	S165, P166, L167, S168, A169, S173, Y174, G176, W177, E178, D179, W180, S181, G182, T183, N184, F185, G186, V187, L188, Q189, A190	22	0.64
5	E34, N35, S36, L37, P38, P39, D40, S41	8	0.632
6	P64, V65, P66, D67, G68, T69, P125, P126, G127, A128, T129, I130, P131, Q132, S133, P134, D135, Q137, T138, S140, N141, F142, M144, Q205, D206, V207, Q208, P209, Q210, P211, M212	31	0.608

Supplementary Table 9 Nucleotide and deduced amino acid similarities of CaKoV

Supplementary Table 9a Nucleotide sequence similarities of the CaKoV complete coding sequences (CDSs)

Sequences	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33			
1 PP320363	ID	0.969	0.968	0.966	0.968	0.965	0.96	0.954	0.955	0.965	0.96	0.96	0.961	0.869	0.896	0.945	0.95	0.953	0.952	0.876	0.848	0.85	0.888	0.859	0.882	0.891	0.843	0.839	0.843	0.854	0.867	0.868	0.846			
2 PP320367	0.969	ID	0.973	0.973	0.965	0.964	0.959	0.954	0.953	0.965	0.96	0.96	0.961	0.867	0.891	0.945	0.948	0.95	0.952	0.877	0.847	0.848	0.886	0.86	0.881	0.889	0.841	0.836	0.84	0.855	0.867	0.866	0.841			
3 PP320368	0.968	0.973	ID	0.972	0.96	0.96	0.954	0.951	0.951	0.962	0.955	0.955	0.957	0.865	0.89	0.944	0.946	0.949	0.951	0.874	0.844	0.845	0.886	0.857	0.879	0.887	0.838	0.834	0.837	0.851	0.863	0.864	0.841			
4 PP320362	0.966	0.973	0.972	ID	0.961	0.962	0.954	0.949	0.95	0.962	0.957	0.957	0.959	0.864	0.887	0.941	0.945	0.947	0.948	0.873	0.843	0.845	0.884	0.856	0.878	0.885	0.839	0.836	0.839	0.851	0.863	0.861	0.841			
5 PP320369	0.968	0.965	0.96	0.961	ID	0.963	0.959	0.951	0.953	0.964	0.958	0.958	0.958	0.865	0.89	0.944	0.947	0.95	0.95	0.873	0.845	0.844	0.885	0.857	0.882	0.89	0.841	0.837	0.841	0.854	0.867	0.862	0.843			
6 PP320364	0.965	0.964	0.96	0.962	0.963	ID	0.959	0.952	0.952	0.962	0.955	0.955	0.958	0.863	0.89	0.943	0.945	0.947	0.947	0.875	0.843	0.844	0.884	0.856	0.88	0.887	0.839	0.835	0.839	0.852	0.863	0.863	0.842			
7 PP320365	0.96	0.959	0.954	0.954	0.959	0.959	ID	0.95	0.951	0.956	0.95	0.95	0.955	0.861	0.884	0.936	0.941	0.943	0.943	0.871	0.842	0.845	0.881	0.855	0.878	0.882	0.838	0.834	0.838	0.853	0.863	0.86	0.843			
8 PP320366	0.954	0.954	0.951	0.949	0.951	0.952	0.95	ID	0.963	0.95	0.946	0.946	0.949	0.857	0.879	0.932	0.939	0.94	0.939	0.876	0.849	0.848	0.873	0.859	0.882	0.881	0.84	0.837	0.841	0.854	0.865	0.865	0.845			
9 PP320370	0.955	0.953	0.951	0.95	0.953	0.952	0.951	0.963	ID	0.951	0.947	0.947	0.95	0.857	0.878	0.931	0.937	0.938	0.939	0.878	0.848	0.849	0.875	0.858	0.884	0.88	0.842	0.837	0.842	0.853	0.867	0.865	0.847			
10 PP320361	0.965	0.965	0.962	0.962	0.964	0.962	0.956	0.95	0.951	ID	0.965	0.965	0.963	0.864	0.889	0.946	0.949	0.951	0.952	0.875	0.845	0.846	0.886	0.859	0.881	0.887	0.84	0.837	0.841	0.854	0.865	0.863	0.841			
11 PP320359	0.96	0.96	0.955	0.957	0.958	0.955	0.95	0.946	0.947	0.965	ID	0.999	0.956	0.861	0.884	0.939	0.945	0.943	0.942	0.871	0.842	0.844	0.88	0.856	0.879	0.881	0.839	0.835	0.839	0.85	0.862	0.861	0.84			
12 PP320360	0.96	0.96	0.955	0.957	0.958	0.955	0.95	0.946	0.947	0.965	ID	0.999	0.956	0.861	0.884	0.939	0.945	0.943	0.942	0.871	0.842	0.844	0.88	0.856	0.879	0.881	0.839	0.835	0.839	0.85	0.862	0.861	0.84			
13 PP320358	0.961	0.961	0.957	0.959	0.958	0.958	0.955	0.949	0.95	0.963	0.956	0.956	ID	0.862	0.887	0.943	0.946	0.949	0.95	0.873	0.845	0.845	0.881	0.854	0.879	0.883	0.838	0.835	0.839	0.852	0.865	0.86	0.84			
14 OM451182.1	0.869	0.867	0.865	0.864	0.865	0.863	0.861	0.857	0.857	0.864	0.861	0.861	0.862	ID	0.934	0.878	0.881	0.884	0.884	0.899	0.921	0.92	0.93	0.932	0.903	0.925	0.913	0.909	0.914	0.928	0.906	0.914	0.914			
15 MN449341.1	0.896	0.891	0.89	0.887	0.889	0.89	0.884	0.879	0.878	0.889	0.884	0.884	0.887	0.934	ID	0.903	0.907	0.91	0.91	0.917	0.916	0.916	0.965	0.93	0.921	0.97	0.909	0.905	0.908	0.919	0.927	0.935	0.912			
16 MK201779.1	0.945	0.945	0.944	0.941	0.944	0.943	0.936	0.932	0.931	0.946	0.939	0.939	0.943	0.878	0.903	ID	0.97	0.965	0.964	0.872	0.857	0.86	0.898	0.868	0.893	0.901	0.851	0.846	0.85	0.864	0.879	0.877	0.853			
17 MK201778.1	0.95	0.948	0.946	0.945	0.947	0.945	0.941	0.939	0.937	0.949	0.945	0.945	0.946	0.881	0.907	0.97	ID	0.968	0.967	0.878	0.863	0.862	0.902	0.874	0.898	0.907	0.854	0.849	0.854	0.873	0.881	0.857				
18 MK201776.1	0.953	0.95	0.949	0.947	0.95	0.947	0.943	0.94	0.938	0.951	0.943	0.943	0.949	0.884	0.91	0.965	0.968	ID	0.992	0.88	0.861	0.862	0.908	0.874	0.896	0.908	0.854	0.851	0.855	0.869	0.882	0.879	0.857			
19 MK201777.1	0.952	0.952	0.951	0.948	0.95	0.947	0.943	0.939	0.939	0.952	0.942	0.942	0.95	0.884	0.91	0.964	0.967	0.992	ID	0.88	0.861	0.862	0.909	0.873	0.896	0.908	0.854	0.851	0.854	0.869	0.881	0.879	0.857			
20 MT610361.1	0.876	0.877	0.874	0.873	0.873	0.875	0.871	0.876	0.878	0.875	0.871	0.871	0.873	0.899	0.917	0.872	0.878	0.88	0.88	ID	0.896	0.892	0.913	0.906	0.906	0.924	0.885	0.882	0.886	0.9	0.9	0.911	0.89			
21 MH747478.1	0.848	0.847	0.844	0.843	0.845	0.843	0.842	0.849	0.848	0.845	0.842	0.842	0.845	0.921	0.916	0.857	0.863	0.861	0.861	0.896	ID	0.934	0.912	0.933	0.902	0.922	0.93	0.925	0.929	0.931	0.914	0.927	0.93			
22 MN337880.1	0.85	0.848	0.845	0.845	0.844	0.844	0.845	0.848	0.849	0.846	0.844	0.844	0.845	0.92	0.916	0.86	0.862	0.862	0.862	0.892	0.934	ID	0.911	0.928	0.901	0.918	0.926	0.924	0.926	0.929	0.912	0.936	0.936			
23 MF062158.1	0.888	0.886	0.886	0.884	0.885	0.884	0.881	0.873	0.875	0.886	0.888	0.888	0.881	0.93	0.884	0.865	0.898	0.902	0.908	0.909	0.913	0.912	0.911	ID	0.928	0.918	0.964	0.904	0.901	0.904	0.914	0.923	0.928	0.906		
24 KF924623.1	0.859	0.86	0.857	0.856	0.857	0.856	0.855	0.859	0.858	0.859	0.856	0.856	0.854	0.932	0.93	0.868	0.874	0.874	0.873	0.906	0.933	0.928	0.928	ID	0.913	0.935	0.92	0.917	0.922	0.933	0.917	0.926	0.926			
25 MH052678.1	0.882	0.881	0.879	0.878	0.882	0.88	0.875	0.882	0.884	0.881	0.879	0.879	0.879	0.933	0.921	0.893	0.898	0.884	0.86	0.896	0.902	0.901	0.918	0.913	ID	0.926	0.896	0.891	0.927	0.919	0.929	0.92	0.898			
26 JQ911763.1	0.891	0.889	0.887	0.885	0.89	0.887	0.882	0.881	0.88	0.887	0.881	0.881	0.883	0.935	0.97	0.901	0.907	0.908	0.908	0.924	0.922	0.918	0.964	0.935	0.926	ID	0.915	0.912	0.914	0.924	0.932	0.938	0.917			
27 KM068050.1	0.843	0.841	0.838	0.839	0.841	0.839	0.838	0.84	0.842	0.84	0.84	0.84	0.839	0.839	0.838	0.913	0.909	0.851	0.854	0.854	0.854	0.885	0.93	0.926	0.904	0.909	0.92	0.896	0.915	ID	0.977	0.981	0.921	0.907	0.923	0.937
28 KM068049.1	0.839	0.836	0.834	0.836	0.837	0.835	0.834	0.837	0.837	0.837	0.835	0.835	0.835	0.909	0.905	0.846	0.849	0.851	0.851	0.882	0.925	0.924	0.901	0.917	0.891	0.912	0.977	ID	0.974	0.918	0.904	0.919	0.946			
29 KM068051.1	0.843	0.841	0.837	0.839	0.841	0.839	0.838	0.841	0.842	0.841	0.839	0.839	0.839	0.914	0.908	0.85	0.854	0.855	0.854	0.886	0.929	0.926	0.904	0.902	0.897	0.914	0.981	0.974	ID	0.922	0.907	0.924	0.939			
30 JN088541.1	0.854	0.855	0.851	0.851	0.854	0.852	0.853	0.854	0.853	0.854	0.85	0.85	0.852	0.928	0.919	0.864	0.87	0.869	0.869	0.9	0.931	0.929	0.914	0.933	0.919	0.924	0.921	0.918	0.922	ID	0.941	0.926	0.926			
31 JN387133.1	0.867	0.867	0.863	0.863	0.864	0.863	0.863	0.865	0.867	0.865	0.862	0.862	0.865	0.862	0.863	0.879	0.883	0.882	0.881	0.9	0.914	0.912	0.923	0.917	0.929	0.932	0.907	0.904	0.907	0.941	ID	0.932	0.911			
32 KC161964.1	0.868	0.866	0.864	0.861	0.862	0.863	0.86	0.865	0.865	0.865	0.863	0.861	0.861	0.86	0.914	0.935	0.877	0.881	0.879	0.879	0.911	0.927	0.936	0.928	0.926	0.92	0.938	0.923	0.919	0.924	0.926	0.932	ID	0.928		
33 KM068048.1	0.846	0.841	0.841	0.841	0.843	0.842	0.843	0.845	0.847	0.841	0.84	0.84	0.84	0.84	0.914	0.912	0.853	0.857	0.857	0.857	0.857	0.857	0.936	0.906	0.926	0.898	0.917	0.937	0.946	0.939	0.926	0.911	0.928	ID		

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61 Supplementary Table 9b Deduced amino acid sequence similarities of the CaKoV complete coding sequences (CDSs)

Sequences	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
1 PP320363	ID	0.95	0.946	0.949	0.956	0.955	0.941	0.926	0.929	0.95	0.942	0.941	0.943	0.85	0.891	0.929	0.939	0.94	0.939	0.845	0.817	0.822	0.874	0.826	0.839	0.88	0.811	0.807	0.812	0.823	0.835	0.843	0.819
2 PP320367																																	

Supplementary Table 9c Nucleotide sequence similarities of the CaKoV P1 region

Sequences	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
1 PP320363	ID	0.96	0.959	0.956	0.964	0.961	0.94	0.932	0.931	0.957	0.952	0.952	0.951	0.934	0.968	0.954	0.959	0.961	0.961	0.913	0.894	0.904	0.953	0.909	0.901	0.951	0.895	0.892	0.895	0.9	0.902	0.915	0.899	
2 PP320367	0.96	ID	0.966	0.967	0.951	0.953	0.937	0.929	0.929	0.952	0.946	0.946	0.949	0.928	0.955	0.95	0.948	0.954	0.955	0.909	0.89	0.901	0.946	0.909	0.898	0.941	0.89	0.889	0.89	0.904	0.906	0.912	0.891	
3 PP320368	0.959	0.966	ID	0.967	0.947	0.948	0.935	0.929	0.928	0.952	0.946	0.945	0.95	0.931	0.963	0.951	0.951	0.961	0.963	0.906	0.888	0.896	0.954	0.906	0.899	0.943	0.886	0.884	0.886	0.901	0.898	0.91	0.892	
4 PP320362	0.956	0.967	0.967	ID	0.948	0.952	0.933	0.926	0.927	0.952	0.946	0.946	0.951	0.929	0.956	0.948	0.948	0.955	0.956	0.906	0.89	0.899	0.947	0.904	0.901	0.938	0.887	0.887	0.888	0.9	0.9	0.907	0.89	
5 PP320369	0.964	0.951	0.947	0.948	ID	0.956	0.932	0.924	0.929	0.949	0.945	0.946	0.946	0.925	0.956	0.948	0.953	0.95	0.952	0.906	0.886	0.884	0.945	0.905	0.902	0.941	0.887	0.888	0.885	0.898	0.901	0.903	0.893	
6 PP320364	0.961	0.953	0.948	0.952	0.956	ID	0.94	0.929	0.932	0.95	0.943	0.943	0.948	0.924	0.96	0.951	0.947	0.951	0.952	0.907	0.884	0.895	0.947	0.906	0.899	0.942	0.89	0.887	0.891	0.899	0.899	0.909	0.895	
7 PP320365	0.94	0.937	0.935	0.933	0.932	0.94	ID	0.924	0.922	0.932	0.923	0.928	0.918	0.938	0.933	0.934	0.9237	0.938	0.902	0.881	0.899	0.932	0.901	0.894	0.925	0.887	0.884	0.886	0.899	0.897	0.904	0.897		
8 PP320366	0.932	0.929	0.929	0.926	0.924	0.929	0.924	ID	0.97	0.923	0.925	0.924	0.925	0.91	0.931	0.926	0.93	0.932	0.932	0.92	0.906	0.917	0.921	0.921	0.914	0.929	0.901	0.898	0.901	0.907	0.909	0.921	0.912	
9 PP320370	0.931	0.929	0.928	0.927	0.929	0.932	0.922	0.97	ID	0.924	0.923	0.923	0.928	0.906	0.932	0.924	0.931	0.931	0.932	0.922	0.903	0.918	0.922	0.916	0.914	0.929	0.901	0.936	0.9	0.906	0.907	0.923	0.913	
10 PP320361	0.957	0.952	0.952	0.952	0.949	0.95	0.932	0.923	0.924	ID	0.951	0.951	0.951	0.927	0.955	0.951	0.954	0.959	0.958	0.907	0.883	0.896	0.95	0.907	0.901	0.937	0.889	0.888	0.889	0.899	0.9	0.906	0.889	
11 PP320359	0.952	0.946	0.946	0.946	0.945	0.943	0.925	0.925	0.923	0.951	ID	0.999	0.941	0.924	0.949	0.943	0.952	0.948	0.957	0.906	0.884	0.895	0.942	0.907	0.899	0.931	0.888	0.887	0.887	0.894	0.896	0.904	0.89	
12 PP320360	0.952	0.946	0.945	0.946	0.945	0.943	0.924	0.924	0.923	0.951	0.999	ID	0.941	0.924	0.949	0.943	0.952	0.948	0.946	0.906	0.884	0.895	0.942	0.906	0.898	0.931	0.888	0.886	0.887	0.894	0.895	0.903	0.89	
13 PP320358	0.951	0.949	0.95	0.951	0.946	0.948	0.938	0.925	0.928	0.951	0.941	0.941	ID	0.926	0.956	0.953	0.953	0.956	0.959	0.909	0.886	0.901	0.949	0.905	0.901	0.935	0.889	0.887	0.89	0.901	0.903	0.907	0.895	
14 OM451182.1	0.934	0.928	0.931	0.929	0.925	0.924	0.918	0.91	0.906	0.927	0.924	0.924	0.926	ID	0.93	0.929	0.929	0.935	0.933	0.903	0.882	0.893	0.927	0.899	0.886	0.926	0.879	0.88	0.882	0.892	0.887	0.896	0.887	
15 MN449341.1	0.955	0.963	0.956	0.956	0.96	0.938	0.931	0.932	0.955	0.949	0.949	0.956	0.93	ID	0.954	0.955	0.956	0.966	0.966	0.914	0.89	0.899	0.959	0.896	0.892	0.954	0.981	0.891	0.882	0.901	0.889	0.913	0.896	
16 MK201779.1	0.954	0.95	0.951	0.948	0.948	0.951	0.933	0.926	0.924	0.951	0.943	0.943	0.953	0.929	0.954	ID	0.957	0.956	0.955	0.904	0.886	0.901	0.949	0.903	0.899	0.943	0.885	0.884	0.884	0.898	0.899	0.905	0.891	
17 MK201778.1	0.959	0.948	0.95	0.948	0.953	0.947	0.934	0.93	0.931	0.954	0.952	0.953	0.929	0.955	0.957	ID	0.958	0.958	0.911	0.894	0.9	0.952	0.912	0.907	0.948	0.888	0.886	0.886	0.886	0.903	0.904	0.91	0.893	
18 MK201777.1	0.961	0.954	0.961	0.955	0.95	0.951	0.937	0.932	0.931	0.959	0.948	0.948	0.956	0.935	0.966	0.956	0.958	ID	0.995	0.915	0.887	0.902	0.969	0.909	0.901	0.951	0.889	0.89	0.891	0.903	0.9	0.909	0.896	
19 MK201776.1	0.961	0.955	0.963	0.956	0.952	0.952	0.938	0.932	0.932	0.958	0.947	0.946	0.959	0.933	0.966	0.955	0.958	0.995	ID	0.914	0.886	0.902	0.969	0.907	0.902	0.951	0.89	0.891	0.891	0.903	0.9	0.91	0.896	
20 MT610361.1	0.913	0.909	0.906	0.906	0.906	0.907	0.902	0.92	0.922	0.907	0.906	0.906	0.909	0.903	0.914	0.904	0.91	0.915	0.914	ID	0.907	0.912	0.906	0.927	0.912	0.92	0.899	0.898	0.902	0.917	0.91	0.923	0.908	
21 MH747478.1	0.894	0.89	0.888	0.89	0.886	0.884	0.881	0.906	0.886	0.903	0.883	0.884	0.886	0.882	0.889	0.886	0.894	0.887	0.886	0.907	ID	0.909	0.882	0.905	0.899	0.896	0.895	0.898	0.901	0.9	0.915	0.901		
22 MN337880.1	0.904	0.901	0.896	0.899	0.894	0.895	0.899	0.917	0.918	0.896	0.895	0.895	0.901	0.893	0.899	0.901	0.9	0.902	0.902	0.912	0.909	ID	0.893	0.908	0.901	0.903	0.904	0.909	0.907	0.904	0.903	0.939	0.924	
23 MF062158.1	0.953	0.946	0.954	0.947	0.945	0.947	0.932	0.921	0.922	0.95	0.942	0.942	0.949	0.927	0.959	0.949	0.952	0.969	0.969	0.906	0.882	0.893	ID	0.902	0.899	0.947	0.885	0.885	0.887	0.894	0.894	0.902	0.888	
24 KF924623.1	0.909	0.909	0.906	0.904	0.905	0.906	0.901	0.921	0.916	0.907	0.907	0.906	0.905	0.899	0.906	0.903	0.912	0.909	0.969	0.907	0.927	0.905	0.908	0.902	ID	0.899	0.911	0.897	0.898	0.901	0.921	0.92	0.926	0.912
25 MH052678.1	0.901	0.898	0.899	0.901	0.902	0.899	0.894	0.914	0.914	0.901	0.899	0.898	0.901	0.886	0.902	0.899	0.907	0.901	0.902	0.912	0.899	0.901	0.899	0.919	ID	0.905	0.895	0.893	0.896	0.937	0.933	0.916	0.903	
26 JQ911763.1	0.951	0.941	0.943	0.938	0.941	0.942	0.925	0.929	0.929	0.937	0.931	0.931	0.935	0.926	0.954	0.943	0.948	0.951	0.951	0.92	0.896	0.903	0.947	0.911	0.905	ID	0.899	0.899	0.895	0.908	0.904	0.912	0.902	
27 KM1068050.1	0.895	0.89	0.886	0.887	0.887	0.89	0.887	0.901	0.901	0.889	0.888	0.888	0.888	0.889	0.879	0.891	0.885	0.888	0.889	0.89	0.899	0.896	0.904	0.885	0.897	0.895	0.899	ID	0.972	0.975	0.89	0.895	0.914	0.916
28 KM1068049.1	0.892	0.889	0.884	0.887	0.888	0.887	0.884	0.898	0.896	0.888	0.887	0.886	0.887	0.888	0.891	0.885	0.886	0.89	0.891	0.898	0.895	0.909	0.885	0.898	0.893	0.899	0.972	ID	0.973	0.899	0.896	0.915	0.93	
29 KM1068051.1	0.895	0.89	0.886	0.888	0.885	0.891	0.886	0.901	0.9	0.889	0.887	0.887	0.89	0.882	0.892	0.884	0.886	0.891	0.891	0.902	0.898	0.907	0.887	0.901	0.896	0.895	0.975	0.973	ID	0.89	0.896	0.919	0.924	
30 JN088541.1	0.9	0.904	0.901	0.9	0.898	0.899	0.899	0.907	0.906	0.899	0.894	0.894	0.901	0.892	0.901	0.898	0.903	0.903	0.903	0.917	0.901	0.904	0.894	0.921	0.937	0.908	0.89	0.899	ID	0.953	0.917	0.902		
31 JN387133.1	0.902	0.906	0.898	0.9	0.901	0.899	0.897	0.909	0.907	0.9	0.896	0.895	0.903	0.887	0.899	0.899	0.904	0.9	0.9	0.91	0.9	0.903	0.894	0.92	0.933	0.904	0.895	0.896	0.896	0.953	ID	0.918	0.902	
32 KC161964.1	0.915	0.912	0.91	0.907	0.903	0.909	0.904	0.921	0.923	0.906	0.904	0.903	0.907	0.896	0.913	0.905	0.921	0.909	0.91	0.923	0.915	0.939	0.902	0.926	0.916	0.912	0.9							

Supplementary Table 9e Nucleotide sequence similarities of the CaKoV P2 region

Sequences	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
1 PP320363	ID	0.977	0.973	0.973	0.967	0.967	0.967	0.968	0.962	0.973	0.968	0.968	0.971	0.967	0.977	0.959	0.967	0.973	0.974	0.961	0.955	0.949	0.973	0.965	0.965	0.973	0.944	0.938	0.943	0.956	0.953	0.955	0.938	
2 PP320367	ID	0.985	0.985	0.968	0.973	0.968	0.971	0.965	0.978	0.971	0.971	0.969	0.967	0.974	0.961	0.974	0.971	0.977	0.963	0.956	0.945	0.977	0.97	0.967	0.975	0.944	0.936	0.941	0.957	0.954	0.951	0.937		
3 PP320368	ID	0.978	0.963	0.968	0.962	0.961	0.959	0.972	0.965	0.965	0.966	0.959	0.967	0.959	0.965	0.968	0.971	0.957	0.95	0.945	0.969	0.966	0.96	0.971	0.943	0.932	0.938	0.95	0.951	0.949	0.934			
4 PP320362	ID	0.978	ID	0.964	0.964	0.969	0.962	0.964	0.961	0.972	0.967	0.967	0.969	0.961	0.967	0.958	0.966	0.967	0.971	0.958	0.952	0.944	0.97	0.963	0.959	0.969	0.939	0.932	0.937	0.953	0.951	0.948	0.934	
5 PP320369	ID	0.964	ID	0.964	0.964	0.974	0.963	0.965	0.975	0.966	0.966	0.973	0.957	0.971	0.956	0.965	0.971	0.972	0.954	0.951	0.939	0.965	0.959	0.962	0.973	0.943	0.935	0.942	0.957	0.955	0.947	0.936		
6 PP320364	ID	0.968	ID	0.962	0.963	0.961	0.972	0.963	0.963	0.966	0.959	0.967	0.955	0.963	0.967	0.97	0.958	0.95	0.944	0.967	0.963	0.961	0.97	0.943	0.939	0.942	0.956	0.952	0.951	0.951	0.938			
7 PP320365	ID	0.962	0.974	0.962	0.974	0.962	ID	0.966	0.963	0.962	0.962	0.962	0.968	0.957	0.973	0.956	0.966	0.967	0.969	0.97	0.955	0.947	0.938	0.969	0.958	0.958	0.969	0.938	0.931	0.937	0.955	0.953	0.945	0.935
8 PP320366	ID	0.961	0.963	0.963	0.963	0.966	ID	0.956	0.969	0.962	0.962	0.967	0.961	0.973	0.953	0.966	0.971	0.972	0.955	0.949	0.938	0.964	0.963	0.962	0.966	0.939	0.933	0.939	0.954	0.95	0.945	0.932		
9 PP320370	ID	0.965	0.959	0.961	0.965	0.961	0.963	0.956	ID	0.969	0.959	0.962	0.963	0.954	0.962	0.952	0.966	0.959	0.962	0.951	0.948	0.937	0.963	0.968	0.958	0.956	0.962	0.936	0.93	0.934	0.95	0.951	0.944	0.931
10 PP320361	ID	0.978	0.972	0.972	0.975	0.972	0.972	0.969	0.969	ID	0.971	0.971	0.976	0.965	0.978	0.965	0.974	0.976	0.983	0.962	0.957	0.947	0.977	0.971	0.965	0.977	0.942	0.937	0.942	0.959	0.956	0.95	0.937	
11 PP320359	ID	0.965	0.967	0.966	0.963	0.962	0.962	0.959	0.971	ID	1	0.965	0.958	0.966	0.957	0.963	0.965	0.965	0.959	0.95	0.944	0.963	0.96	0.959	0.966	0.942	0.936	0.942	0.953	0.951	0.952	0.935		
12 PP320360	ID	0.965	0.967	0.966	0.963	0.962	0.962	0.959	0.971	ID	1	0.965	0.958	0.966	0.957	0.963	0.965	0.965	0.959	0.95	0.944	0.963	0.96	0.959	0.966	0.942	0.936	0.942	0.953	0.951	0.952	0.935		
13 PP320358	ID	0.969	0.966	0.969	0.973	0.966	0.968	0.967	0.963	0.976	0.965	0.965	ID	0.96	0.971	0.963	0.965	0.965	0.975	0.978	0.955	0.953	0.945	0.966	0.96	0.959	0.971	0.941	0.938	0.941	0.956	0.956	0.948	0.935
14 OM451182.1	0.967	0.967	0.959	0.961	0.957	0.959	0.957	0.961	0.954	0.965	0.958	0.958	0.96	ID	0.968	0.954	0.96	0.962	0.967	0.953	0.955	0.941	0.963	0.957	0.955	0.967	0.942	0.932	0.939	0.951	0.953	0.945	0.932	
15 MN449341.1	0.977	0.974	0.967	0.967	0.971	0.967	0.973	0.973	0.962	0.978	0.966	0.966	0.971	0.968	ID	0.961	0.975	0.977	0.98	0.96	0.955	0.946	0.976	0.969	0.965	0.977	0.944	0.937	0.941	0.957	0.957	0.945	0.942	
16 MK201779.1	0.959	0.961	0.959	0.958	0.956	0.955	0.956	0.953	0.952	0.965	0.957	0.957	0.963	0.954	0.961	ID	0.96	0.962	0.962	0.948	0.946	0.937	0.965	0.954	0.953	0.962	0.937	0.929	0.934	0.945	0.948	0.947	0.931	
17 MK201778.1	0.967	0.974	0.965	0.966	0.965	0.963	0.966	0.965	0.969	0.974	0.963	0.963	0.965	0.96	0.975	ID	0.968	0.971	0.96	0.958	0.948	0.971	0.975	0.961	0.959	0.974	0.942	0.934	0.941	0.96	0.955	0.953	0.94	
18 MK201776.1	0.973	0.971	0.968	0.967	0.971	0.967	0.969	0.971	0.969	0.976	0.965	0.965	0.975	0.962	0.977	0.962	0.968	ID	0.985	0.957	0.955	0.943	0.971	0.963	0.958	0.972	0.941	0.937	0.942	0.956	0.956	0.951	0.937	
19 MK201777.1	0.974	0.977	0.971	0.971	0.972	0.97	0.977	0.972	0.962	0.983	0.965	0.965	0.978	0.967	0.98	0.962	0.971	0.985	ID	0.96	0.957	0.943	0.975	0.967	0.961	0.973	0.942	0.936	0.941	0.957	0.956	0.95	0.936	
20 MT610361.1	0.961	0.963	0.957	0.958	0.954	0.958	0.955	0.955	0.951	0.962	0.959	0.959	0.955	0.953	0.96	0.948	0.96	0.957	0.96	ID	0.947	0.934	0.959	0.956	0.955	0.961	0.932	0.929	0.931	0.945	0.944	0.94	0.931	
21 MH747478.1	0.955	0.956	0.95	0.952	0.951	0.95	0.947	0.949	0.948	0.957	0.95	0.95	0.953	0.955	0.955	0.946	0.958	0.955	0.957	0.947	ID	0.945	0.956	0.952	0.947	0.959	0.941	0.933	0.938	0.953	0.953	0.947	0.938	
22 MN337880.1	0.949	0.945	0.945	0.944	0.939	0.944	0.938	0.938	0.937	0.947	0.944	0.944	0.945	0.941	0.946	0.937	0.948	0.943	0.943	0.934	0.945	ID	0.941	0.941	0.939	0.947	0.929	0.937	0.942	0.938	0.948	0.935		
23 MF062158.1	0.973	0.977	0.969	0.97	0.965	0.967	0.969	0.964	0.963	0.977	0.963	0.963	0.966	0.963	0.976	0.965	0.971	0.971	0.975	0.959	0.956	0.941	ID	0.966	0.969	0.974	0.938	0.932	0.937	0.952	0.951	0.945	0.935	
24 KP924623.1	0.965	0.97	0.966	0.963	0.959	0.963	0.958	0.963	0.958	0.971	0.96	0.96	0.96	0.957	0.969	0.954	0.961	0.963	0.967	0.956	0.952	0.941	0.966	ID	0.962	0.968	0.936	0.93	0.936	0.95	0.948	0.943	0.932	
25 MH052678.1	0.965	0.967	0.96	0.959	0.962	0.961	0.958	0.962	0.956	0.965	0.959	0.959	0.959	0.955	0.965	0.953	0.959	0.958	0.961	0.955	0.947	0.939	0.959	0.962	ID	0.963	0.941	0.935	0.942	0.955	0.95	0.948	0.929	
26 JQ911763.1	0.973	0.975	0.971	0.969	0.973	0.97	0.969	0.966	0.962	0.977	0.966	0.966	0.967	0.971	0.967	0.977	0.962	0.974	0.972	0.973	0.961	0.959	0.947	0.974	0.968	0.963	ID	0.943	0.941	0.944	0.957	0.958	0.954	0.942
27 KM1068050.1	0.944	0.944	0.943	0.939	0.943	0.943	0.938	0.939	0.936	0.942	0.942	0.942	0.941	0.942	0.944	0.937	0.942	0.941	0.942	0.932	0.941	0.937	0.938	0.936	0.941	0.943	ID	0.974	0.984	0.935	0.936	0.951	0.942	
28 KM1068049.1	0.938	0.936	0.932	0.932	0.935	0.939	0.931	0.933	0.933	0.937	0.936	0.936	0.938	0.932	0.937	0.929	0.934	0.937	0.936	0.929	0.933	0.929	0.932	0.93	0.935	0.941	0.974	ID	0.973	0.93	0.93	0.944	0.953	
29 KM1068051.1	0.943	0.941	0.938	0.937	0.942	0.942	0.937	0.939	0.934	0.942	0.942	0.942	0.941	0.939	0.941	0.934	0.941	0.942	0.941	0.931	0.938	0.935	0.937	0.936	0.942	0.944	0.984	0.973	ID	0.937	0.933	0.95	0.936	
30 JN088541.1	0.956	0.957	0.95	0.953	0.957	0.956	0.955	0.954	0.95	0.959	0.952	0.953	0.956	0.951	0.957	0.945	0.96	0.956	0.957	0.945	0.953	0.942	0.952	0.95	0.955	0.957	0.935	0.93	0.937	ID	0.969	0.963	0.953	
31 JN387133.1	0.953	0.954	0.951	0.951	0.955	0.952	0.953	0.95	0.951	0.956	0.951	0.951	0.956	0.953	0.957	0.948	0.955	0.956	0.956	0.956	0.944	0.953	0.938	0.951	0.948	0.95	0.958	0.936	0.93	0.933	0.969	ID	0.948	0.935
32 KC161964.1	0.955	0.951	0.949	0.948	0.947	0.951	0.945	0.945	0.944	0.95	0.952	0.952	0.948	0.945	0.953	0.947	0.953	0.951	0.95	0.944	0.947	0.948	0.945	0.943	0.948	0.954	0.951	0.944	0.95	0.953	0.948	ID	0.942	
33 KM1068048.1	0.938	0.937	0.934	0.934	0.936	0.938	0.935	0.932	0.932	0.931	0.937	0.935	0.935	0.935	0.932	0.942	0.931	0.94	0.937	0.936	0.931	0.938	0.935	0.935	0.932	0.929	0.942	0.942	0.953	0.936	0.935	0.935	0.942	ID

Supplementary Table 9f Deduced amino acid sequence similarities of the CaKoV P2 region

Sequences	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
1 PP320363	ID	1	0.998	1	1	0.998	1	1	1	0.998	1	1	1	0.993	1	1	1	1	1	1	0.995	1	0.986	1	0.995	0.995	0.998	0.99	0.986	0.993	1	0.995	0.995	0.99
2 PP320367	ID	1	0.998	1	1	0.998	1	1	1	0.998	1	1	1	1	0.993																			

Supplementary Table 9g Nucleotide sequence similarities of the CaKoV P3 region

Sequences	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
1 PP320363	ID	0.977	0.979	0.973	0.974	0.969	0.974	0.968	0.971	0.967	0.965	0.965	0.963	0.974	0.974	0.971	0.973	0.975	0.973	0.964	0.951	0.951	0.969	0.96	0.96	0.977	0.945	0.943	0.947	0.952	0.953	0.958	0.948	
2 PP320367	0.977	ID	0.975	0.97	0.98	0.973	0.976	0.969	0.972	0.97	0.967	0.967	0.967	0.974	0.976	0.97	0.973	0.977	0.976	0.965	0.951	0.95	0.97	0.963	0.958	0.979	0.942	0.94	0.944	0.954	0.95	0.957	0.944	
3 PP320368	0.979	0.975	ID	0.971	0.974	0.968	0.97	0.967	0.969	0.964	0.961	0.961	0.959	0.97	0.974	0.972	0.973	0.971	0.971	0.964	0.95	0.948	0.966	0.957	0.959	0.973	0.941	0.941	0.943	0.951	0.948	0.954	0.944	
4 PP320362	0.973	0.97	0.971	ID	0.972	0.966	0.97	0.962	0.965	0.965	0.961	0.961	0.958	0.97	0.972	0.964	0.969	0.97	0.969	0.961	0.944	0.946	0.966	0.957	0.951	0.974	0.942	0.941	0.945	0.949	0.946	0.949	0.945	
5 PP320369	0.974	0.98	0.974	0.972	ID	0.971	0.976	0.967	0.972	0.97	0.966	0.966	0.961	0.979	0.976	0.972	0.972	0.979	0.977	0.966	0.95	0.951	0.972	0.962	0.964	0.982	0.95	0.946	0.951	0.956	0.955	0.959	0.949	
6 PP320364	0.969	0.973	0.968	0.966	0.971	ID	0.974	0.972	0.969	0.967	0.963	0.963	0.965	0.97	0.974	0.971	0.973	0.973	0.972	0.966	0.949	0.948	0.967	0.956	0.96	0.976	0.939	0.938	0.941	0.95	0.945	0.952	0.942	
7 PP320365	0.974	0.976	0.97	0.97	0.976	0.974	ID	0.969	0.97	0.97	0.965	0.965	0.962	0.971	0.973	0.967	0.97	0.976	0.973	0.964	0.951	0.949	0.971	0.961	0.959	0.979	0.943	0.943	0.944	0.951	0.948	0.952	0.946	
8 PP320366	0.968	0.969	0.967	0.962	0.967	0.972	0.969	ID	0.966	0.961	0.957	0.957	0.96	0.968	0.97	0.967	0.967	0.97	0.967	0.961	0.948	0.946	0.964	0.954	0.954	0.97	0.938	0.938	0.939	0.949	0.945	0.951	0.941	
9 PP320370	0.971	0.972	0.969	0.965	0.972	0.969	0.97	0.966	ID	0.964	0.962	0.962	0.964	0.976	0.968	0.968	0.97	0.974	0.973	0.965	0.948	0.945	0.97	0.941	0.973	0.943	0.943	0.949	0.948	0.951	0.941	0.941	0.941	
10 PP320361	0.967	0.97	0.964	0.965	0.97	0.967	0.97	0.961	0.964	ID	0.977	0.977	0.964	0.968	0.968	0.967	0.966	0.969	0.967	0.961	0.948	0.95	0.964	0.957	0.959	0.972	0.944	0.942	0.947	0.953	0.948	0.955	0.947	
11 PP320359	0.965	0.967	0.961	0.961	0.966	0.963	0.965	0.957	0.962	0.977	ID	1	0.961	0.963	0.969	0.965	0.964	0.967	0.964	0.956	0.943	0.945	0.961	0.956	0.955	0.969	0.942	0.939	0.944	0.95	0.945	0.949	0.943	
12 PP320360	0.965	0.967	0.961	0.961	0.966	0.963	0.965	0.957	0.962	0.977	1	ID	0.961	0.963	0.969	0.965	0.964	0.967	0.964	0.956	0.943	0.945	0.961	0.956	0.955	0.969	0.942	0.939	0.944	0.95	0.945	0.949	0.943	
13 PP320358	0.963	0.967	0.959	0.958	0.961	0.965	0.962	0.96	0.964	0.964	0.961	0.961	ID	0.964	0.965	0.963	0.964	0.966	0.963	0.957	0.949	0.945	0.967	0.938	0.937	0.941	0.945	0.944	0.945	0.944	0.945	0.939		
14 OM451182.1	0.974	0.974	0.97	0.97	0.979	0.97	0.971	0.968	0.976	0.968	0.963	0.963	0.964	ID	0.976	0.969	0.971	0.978	0.976	0.966	0.95	0.948	0.97	0.961	0.962	0.979	0.946	0.944	0.948	0.955	0.952	0.958	0.946	
15 MN449341.1	0.974	0.976	0.974	0.972	0.976	0.974	0.973	0.97	0.968	0.968	0.969	0.969	0.965	0.976	ID	0.978	0.978	0.976	0.974	0.967	0.948	0.951	0.969	0.961	0.96	0.981	0.942	0.939	0.944	0.951	0.95	0.955	0.942	
16 MK201779.1	0.971	0.97	0.972	0.964	0.972	0.971	0.967	0.965	0.968	0.967	0.965	0.965	0.963	0.969	0.978	ID	0.988	0.973	0.971	0.963	0.946	0.949	0.964	0.957	0.96	0.974	0.939	0.936	0.942	0.949	0.95	0.955	0.94	
17 MK201778.1	0.973	0.973	0.973	0.969	0.972	0.973	0.97	0.97	0.97	0.966	0.964	0.964	0.964	0.971	0.978	0.988	ID	0.976	0.974	0.966	0.948	0.949	0.966	0.96	0.96	0.976	0.942	0.94	0.944	0.95	0.949	0.955	0.942	
18 MK201776.1	0.975	0.977	0.971	0.97	0.979	0.973	0.976	0.97	0.974	0.969	0.967	0.967	0.966	0.978	0.976	0.973	0.976	ID	0.995	0.97	0.953	0.948	0.973	0.963	0.962	0.983	0.942	0.941	0.944	0.952	0.952	0.957	0.946	
19 MK201777.1	0.973	0.976	0.971	0.969	0.977	0.972	0.973	0.967	0.973	0.967	0.973	0.967	0.964	0.964	0.974	0.971	0.974	0.995	ID	0.969	0.952	0.947	0.971	0.96	0.96	0.98	0.941	0.94	0.943	0.951	0.95	0.957	0.944	
20 MT1610361.1	0.964	0.965	0.964	0.961	0.966	0.966	0.964	0.961	0.965	0.961	0.956	0.956	0.957	0.966	0.967	0.963	0.966	0.97	0.969	ID	0.948	0.948	0.961	0.955	0.957	0.971	0.94	0.939	0.942	0.948	0.945	0.952	0.943	
21 MH747478.1	0.951	0.951	0.95	0.944	0.95	0.949	0.951	0.948	0.948	0.948	0.943	0.943	0.949	0.95	0.948	0.946	0.948	0.953	0.952	0.948	ID	0.949	0.948	0.941	0.942	0.951	0.939	0.94	0.944	0.951	0.946	0.95	0.943	
22 MN337880.1	0.951	0.95	0.948	0.946	0.951	0.948	0.949	0.946	0.945	0.945	0.945	0.945	0.948	0.951	0.949	0.949	0.948	0.947	0.948	0.949	ID	0.946	0.935	0.941	0.948	0.939	0.937	0.939	0.951	0.948	0.953	0.943		
23 MF062158.1	0.969	0.97	0.966	0.966	0.972	0.967	0.971	0.964	0.97	0.964	0.961	0.961	0.957	0.97	0.969	0.964	0.966	0.967	0.973	0.971	0.961	0.948	0.946	ID	0.961	0.956	0.975	0.941	0.938	0.941	0.95	0.949	0.954	0.941
24 KP924623.1	0.96	0.963	0.967	0.957	0.962	0.956	0.961	0.954	0.959	0.957	0.956	0.956	0.95	0.961	0.961	0.957	0.96	0.963	0.96	0.955	0.941	0.935	0.961	ID	0.952	0.967	0.932	0.931	0.935	0.94	0.936	0.942	0.933	
25 MH052678.1	0.96	0.958	0.959	0.951	0.964	0.96	0.959	0.954	0.959	0.959	0.955	0.955	0.953	0.962	0.96	0.96	0.96	0.962	0.96	0.957	0.942	0.941	0.956	0.952	ID	0.968	0.937	0.936	0.941	0.947	0.944	0.946	0.94	
26 JQ911763.1	0.977	0.979	0.973	0.974	0.982	0.976	0.979	0.97	0.974	0.972	0.969	0.969	0.967	0.979	0.981	0.976	0.976	0.983	0.98	0.971	0.951	0.948	0.975	0.967	0.968	ID	0.946	0.943	0.947	0.955	0.953	0.947	0.946	
27 KM1068050.1	0.945	0.942	0.941	0.942	0.95	0.939	0.943	0.938	0.941	0.944	0.942	0.942	0.938	0.946	0.942	0.939	0.942	0.942	0.941	0.94	0.939	0.939	0.941	0.932	0.937	0.946	ID	0.985	0.99	0.946	0.947	0.943	0.953	
28 KM1068049.1	0.943	0.94	0.941	0.941	0.946	0.938	0.943	0.938	0.938	0.942	0.939	0.939	0.937	0.944	0.939	0.936	0.94	0.941	0.94	0.939	0.939	0.937	0.938	0.931	0.936	0.943	0.985	ID	0.982	0.945	0.945	0.938	0.962	
29 KM1068051.1	0.947	0.944	0.943	0.945	0.951	0.941	0.944	0.939	0.943	0.947	0.944	0.944	0.941	0.948	0.944	0.942	0.944	0.944	0.943	0.942	0.94	0.939	0.941	0.935	0.941	0.947	0.99	0.982	ID	0.947	0.948	0.944	0.956	
30 JN088541.1	0.952	0.954	0.951	0.949	0.956	0.95	0.951	0.949	0.949	0.953	0.95	0.95	0.945	0.955	0.951	0.949	0.95	0.948	0.951	0.952	0.951	0.948	0.951	0.95	0.94	0.947	0.955	0.946	0.945	0.947	ID	0.967	0.953	0.951
31 JN387133.1	0.953	0.95	0.948	0.946	0.955	0.945	0.948	0.945	0.948	0.948	0.945	0.945	0.944	0.952	0.95	0.95	0.949	0.952	0.95	0.945	0.946	0.948	0.949	0.936	0.944	0.953	0.947	0.945	0.948	0.967	ID	0.953	0.951	
32 KC161964.1	0.958	0.957	0.954	0.949	0.959	0.952	0.952	0.951	0.951	0.955	0.949	0.949	0.945	0.958	0.955	0.955	0.955	0.957	0.957	0.952	0.95	0.953	0.954	0.942	0.946	0.957	0.943	0.						

Supplementary Table 9i Nucleotide sequence similarities of the CaKoV VP1 gene

Sequences	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
1 PP320363	ID	0.946	0.948	0.944	0.976	0.958	0.904	0.87	0.868	0.954	0.949	0.949	0.94	0.919	0.95	0.943	0.949	0.949	0.954	0.851	0.829	0.852	0.947	0.865	0.871	0.907	0.85	0.846	0.854	0.857	0.864	0.87	0.854	
2 PP320367	0.946	ID	0.932	0.936	0.941	0.94	0.899	0.87	0.865	0.93	0.931	0.931	0.925	0.906	0.929	0.926	0.925	0.929	0.929	0.849	0.829	0.856	0.922	0.862	0.858	0.885	0.839	0.838	0.844	0.861	0.865	0.862	0.839	
3 PP320368	0.948	0.932	ID	0.942	0.936	0.935	0.901	0.869	0.866	0.938	0.935	0.935	0.913	0.962	0.937	0.936	0.96	0.965	0.84	0.826	0.85	0.959	0.859	0.866	0.9	0.833	0.832	0.841	0.852	0.851	0.869	0.847		
4 PP320362	0.944	0.936	0.942	ID	0.94	0.944	0.89	0.862	0.862	0.94	0.935	0.935	0.936	0.91	0.94	0.931	0.931	0.94	0.944	0.844	0.828	0.851	0.937	0.859	0.859	0.884	0.828	0.827	0.835	0.857	0.854	0.86	0.838	
5 PP320369	0.976	0.941	0.936	0.94	ID	0.953	0.902	0.872	0.872	0.948	0.948	0.948	0.935	0.91	0.941	0.938	0.943	0.937	0.942	0.848	0.817	0.851	0.937	0.866	0.869	0.901	0.838	0.834	0.842	0.855	0.864	0.859	0.847	
6 PP320364	0.958	0.94	0.935	0.944	0.953	ID	0.905	0.869	0.874	0.948	0.941	0.941	0.94	0.904	0.94	0.944	0.935	0.941	0.946	0.854	0.824	0.845	0.937	0.868	0.871	0.89	0.834	0.833	0.844	0.867	0.864	0.869	0.844	
7 PP320365	0.904	0.899	0.901	0.89	0.902	0.905	ID	0.868	0.868	0.892	0.894	0.894	0.907	0.9	0.895	0.908	0.895	0.896	0.899	0.84	0.894	0.816	0.857	0.894	0.841	0.854	0.851	0.832	0.822	0.83	0.846	0.85	0.852	0.846
8 PP320366	0.87	0.87	0.869	0.862	0.872	0.869	0.868	ID	0.979	0.868	0.869	0.869	0.869	0.853	0.868	0.868	0.875	0.87	0.871	0.882	0.869	0.906	0.863	0.898	0.901	0.857	0.875	0.872	0.884	0.88	0.884	0.908	0.9	
9 PP320370	0.868	0.865	0.866	0.866	0.872	0.874	0.868	0.979	ID	0.868	0.869	0.869	0.871	0.848	0.864	0.865	0.875	0.863	0.866	0.883	0.872	0.905	0.86	0.9	0.907	0.854	0.878	0.871	0.883	0.881	0.883	0.912	0.898	
10 PP320361	0.954	0.93	0.938	0.94	0.948	0.948	0.892	0.868	0.868	ID	0.947	0.947	0.936	0.91	0.938	0.941	0.953	0.947	0.949	0.843	0.821	0.844	0.938	0.864	0.86	0.889	0.841	0.841	0.85	0.851	0.86	0.856	0.841	
11 PP320359	0.949	0.931	0.935	0.935	0.948	0.941	0.894	0.869	0.869	0.947	ID	1	0.917	0.905	0.935	0.924	0.869	0.936	0.938	0.843	0.823	0.851	0.932	0.857	0.858	0.879	0.834	0.832	0.84	0.845	0.845	0.862	0.841	
12 PP320360	0.949	0.931	0.935	0.935	0.948	0.941	0.894	0.869	0.869	0.947	1	ID	0.917	0.905	0.935	0.924	0.926	0.936	0.938	0.843	0.823	0.851	0.932	0.857	0.858	0.879	0.834	0.832	0.84	0.845	0.845	0.862	0.841	
13 PP320358	0.94	0.925	0.935	0.936	0.935	0.94	0.907	0.869	0.871	0.936	0.917	0.917	ID	0.916	0.944	0.96	0.946	0.941	0.946	0.852	0.827	0.859	0.94	0.856	0.857	0.889	0.844	0.84	0.848	0.852	0.858	0.864	0.848	
14 OM451182.1	0.919	0.906	0.913	0.91	0.91	0.904	0.9	0.853	0.848	0.91	0.905	0.905	0.916	ID	0.902	0.913	0.917	0.922	0.919	0.852	0.84	0.866	0.913	0.863	0.845	0.882	0.841	0.84	0.852	0.855	0.851	0.862	0.859	
15 MN449341.1	0.95	0.929	0.962	0.94	0.941	0.94	0.895	0.868	0.864	0.938	0.935	0.935	0.944	0.902	ID	0.944	0.936	0.964	0.965	0.849	0.823	0.844	0.959	0.863	0.845	0.862	0.903	0.832	0.832	0.84	0.849	0.85	0.862	0.839
16 MK201779.1	0.943	0.926	0.937	0.931	0.938	0.944	0.908	0.868	0.865	0.941	0.924	0.924	0.96	0.913	0.944	ID	0.946	0.943	0.948	0.843	0.821	0.85	0.944	0.85	0.856	0.891	0.829	0.826	0.834	0.849	0.852	0.857	0.84	
17 MK201778.1	0.949	0.925	0.936	0.931	0.943	0.935	0.895	0.875	0.875	0.953	0.926	0.926	0.946	0.917	0.936	0.946	ID	0.937	0.942	0.851	0.835	0.853	0.941	0.865	0.864	0.9	0.834	0.83	0.836	0.855	0.868	0.863	0.844	
18 MK201777.1	0.949	0.929	0.96	0.94	0.937	0.941	0.896	0.87	0.863	0.947	0.936	0.936	0.941	0.922	0.964	0.943	0.937	ID	0.995	0.849	0.827	0.85	0.962	0.858	0.852	0.901	0.834	0.836	0.845	0.852	0.854	0.856	0.841	
19 MK201776.1	0.954	0.929	0.965	0.944	0.942	0.946	0.899	0.871	0.866	0.949	0.938	0.938	0.946	0.919	0.965	0.948	0.942	0.995	ID	0.85	0.828	0.851	0.965	0.965	0.854	0.856	0.902	0.838	0.838	0.846	0.854	0.856	0.859	0.842
20 MT610361.1	0.851	0.849	0.84	0.844	0.848	0.854	0.84	0.882	0.883	0.843	0.843	0.843	0.852	0.852	0.849	0.843	0.851	0.849	0.85	ID	0.872	0.894	0.838	0.919	0.898	0.87	0.87	0.882	0.917	0.899	0.906	0.891		
21 MH747478.1	0.829	0.829	0.826	0.828	0.817	0.824	0.816	0.869	0.872	0.821	0.823	0.823	0.827	0.84	0.823	0.821	0.835	0.827	0.828	0.872	ID	0.887	0.822	0.884	0.872	0.846	0.874	0.869	0.878	0.857	0.911	0.889		
22 MX337880.1	0.852	0.856	0.85	0.851	0.851	0.845	0.857	0.906	0.905	0.844	0.851	0.851	0.859	0.866	0.844	0.85	0.853	0.85	0.851	0.894	0.887	ID	0.842	0.901	0.888	0.853	0.905	0.902	0.916	0.885	0.882	0.926	0.924	
23 MF062158.1	0.947	0.922	0.959	0.937	0.937	0.937	0.894	0.863	0.86	0.938	0.932	0.932	0.94	0.913	0.959	0.944	0.941	0.962	0.965	0.838	0.822	0.842	ID	0.854	0.86	0.898	0.828	0.827	0.835	0.842	0.846	0.848	0.834	
24 KP924623.1	0.865	0.862	0.859	0.859	0.866	0.868	0.841	0.898	0.9	0.864	0.857	0.857	0.856	0.863	0.854	0.85	0.865	0.858	0.854	0.919	0.884	0.901	0.854	ID	0.93	0.867	0.88	0.88	0.895	0.922	0.916	0.929	0.91	
25 MH052678.1	0.871	0.858	0.866	0.859	0.869	0.871	0.854	0.901	0.907	0.86	0.858	0.858	0.857	0.845	0.862	0.856	0.864	0.852	0.856	0.898	0.872	0.888	0.86	0.93	ID	0.865	0.871	0.866	0.881	0.929	0.92	0.918	0.899	
26 JQ111763.1	0.907	0.885	0.9	0.884	0.901	0.89	0.851	0.857	0.854	0.889	0.879	0.879	0.889	0.882	0.903	0.891	0.9	0.901	0.902	0.87	0.846	0.853	0.898	0.867	0.865	ID	0.857	0.855	0.85	0.874	0.865	0.869	0.854	
27 KM1068050.1	0.85	0.839	0.833	0.828	0.838	0.834	0.832	0.875	0.878	0.841	0.834	0.834	0.844	0.841	0.832	0.829	0.834	0.834	0.838	0.87	0.874	0.905	0.828	0.88	0.871	ID	0.984	0.968	0.866	0.869	0.908	0.907		
28 KM1068049.1	0.846	0.838	0.832	0.827	0.834	0.833	0.822	0.872	0.871	0.841	0.832	0.832	0.84	0.84	0.832	0.826	0.83	0.836	0.838	0.87	0.869	0.902	0.827	0.88	0.866	0.855	0.984	ID	0.979	0.867	0.866	0.906	0.907	
29 KM1068051.1	0.854	0.844	0.841	0.835	0.842	0.844	0.83	0.884	0.883	0.85	0.84	0.84	0.848	0.852	0.84	0.834	0.836	0.845	0.846	0.882	0.878	0.916	0.835	0.895	0.881	0.85	0.968	0.979	ID	0.874	0.875	0.923	0.928	
30 JN088541.1	0.857	0.861	0.852	0.857	0.855	0.867	0.846	0.88	0.881	0.851	0.845	0.845	0.852	0.855	0.849	0.849	0.855	0.852	0.854	0.917	0.875	0.885	0.842	0.922	0.929	0.874	0.866	0.863	0.874	ID	0.948	0.909	0.885	
31 JN387133.1	0.864	0.865	0.851	0.854	0.864	0.864	0.85	0.884	0.883	0.86	0.845	0.845	0.858	0.851	0.85	0.852	0.868	0.854	0.856	0.899	0.857	0.882	0.846	0.916	0.92	0.865	0.869	0.866	0.875	0.948	ID	0.904	0.892	
32 KC161964.1	0.87	0.862	0.869	0.86	0.864	0.869	0.852	0.908	0.912	0.856	0.862	0.862	0.864	0.862	0.862	0.857	0.863	0.856	0.859	0.906	0.911	0.926	0.848	0.929	0.918	0.869	0.908	0.906	0.923	0.909	0.904	ID	0.93	
33 KM1068048.1	0.854	0.839	0.847	0.838	0.847	0.844	0.846	0.9	0.898	0.841	0.841	0.841	0.848	0.859	0.839	0.84	0.844	0.841	0.842	0.891	0.889	0.924	0.834	0.91	0.899	0.854	0.907	0.907	0.928	0.885	0.892	0.93	ID	

Supplementary Table 9k Deduced amino acid sequence similarities of the CaKoV VP1 gene

Sequences	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
1 PP320363	ID	0.96	0.964	0.964	0.996	0.964	0.946	0.896	0.9	0.971	0.96	0.96	0.978	0.921	0.96	0.975	0.964	0.967	0.978	0.854	0.825	0.85	0.96	0.868	0.886	0.882	0.843	0.825	0.836	0.85	0.864	0.871	0.846
2 PP320367	0.96	ID	0.953	0.946	0.957	0.939	0.943	0.9	0.896	0.946	0.939	0.939	0.953	0.914	0.932	0.95	0.953	0.95	0														

Supplementary Table 9l Nucleotide sequence similarities of the CaKoV 3D gene

Sequences	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
1 PP320363	ID	0.976	0.975	0.975	0.977	0.978	0.977	0.972	0.972	0.967	0.97	0.97	0.969	0.978	0.976	0.976	0.977	0.977	0.97	0.97	0.966	0.962	0.975	0.959	0.962	0.976	0.95	0.95	0.955	0.955	0.964	0.971	0.957	
2 PP320367	0.976	ID	0.973	0.973	0.978	0.98	0.976	0.971	0.973	0.973	0.973	0.973	0.973	0.977	0.982	0.98	0.982	0.976	0.971	0.969	0.969	0.961	0.976	0.964	0.964	0.975	0.944	0.941	0.949	0.956	0.957	0.962	0.949	
3 PP320368	0.975	0.973	ID	0.976	0.982	0.983	0.975	0.975	0.98	0.97	0.967	0.967	0.965	0.978	0.978	0.976	0.981	0.975	0.975	0.971	0.967	0.954	0.977	0.954	0.965	0.973	0.947	0.947	0.952	0.957	0.961	0.961	0.952	
4 PP320362	0.975	0.973	0.976	ID	0.981	0.978	0.977	0.967	0.972	0.967	0.97	0.97	0.962	0.977	0.978	0.976	0.978	0.973	0.969	0.971	0.96	0.956	0.977	0.956	0.959	0.975	0.946	0.944	0.951	0.952	0.955	0.964	0.949	
5 PP320369	0.977	0.978	0.982	0.981	ID	0.983	0.982	0.972	0.98	0.975	0.972	0.972	0.965	0.981	0.983	0.986	0.982	0.977	0.973	0.965	0.959	0.985	0.959	0.972	0.986	0.952	0.947	0.957	0.96	0.964	0.966	0.955		
6 PP320364	0.978	0.98	0.983	0.978	0.983	ID	0.981	0.978	0.981	0.976	0.976	0.976	0.971	0.98	0.985	0.985	0.987	0.978	0.976	0.976	0.969	0.959	0.981	0.957	0.969	0.977	0.946	0.946	0.951	0.956	0.96	0.967	0.954	
7 PP320365	0.977	0.976	0.975	0.977	0.982	0.981	ID	0.97	0.972	0.972	0.97	0.97	0.965	0.973	0.976	0.976	0.981	0.977	0.97	0.97	0.962	0.957	0.982	0.956	0.964	0.978	0.942	0.945	0.947	0.952	0.956	0.967	0.95	
8 PP320366	0.972	0.971	0.975	0.967	0.972	0.978	0.97	ID	0.972	0.966	0.967	0.967	0.967	0.973	0.973	0.976	0.975	0.967	0.967	0.961	0.957	0.97	0.946	0.96	0.971	0.94	0.942	0.945	0.952	0.956	0.959	0.947		
9 PP320370	0.972	0.973	0.98	0.972	0.98	0.981	0.972	0.972	ID	0.972	0.967	0.97	0.97	0.967	0.976	0.976	0.978	0.975	0.972	0.972	0.965	0.957	0.977	0.951	0.965	0.971	0.947	0.945	0.952	0.955	0.961	0.965	0.95	
10 PP320361	0.967	0.973	0.97	0.967	0.975	0.976	0.972	0.966	0.97	ID	0.981	0.981	0.967	0.969	0.978	0.983	0.976	0.967	0.962	0.967	0.965	0.957	0.971	0.95	0.959	0.973	0.942	0.94	0.947	0.955	0.959	0.962	0.949	
11 PP320359	0.97	0.973	0.967	0.97	0.972	0.976	0.97	0.967	0.97	0.981	ID	1	0.97	0.969	0.978	0.983	0.976	0.97	0.962	0.965	0.957	0.955	0.97	0.951	0.957	0.973	0.945	0.94	0.95	0.952	0.956	0.961	0.947	
12 PP320360	0.97	0.973	0.967	0.97	0.972	0.976	0.97	0.967	0.97	0.981	1	ID	0.97	0.969	0.978	0.983	0.976	0.97	0.962	0.965	0.957	0.955	0.97	0.951	0.957	0.973	0.945	0.94	0.95	0.952	0.956	0.961	0.947	
13 PP320358	0.969	0.973	0.965	0.962	0.965	0.971	0.965	0.967	0.967	0.967	0.97	0.97	ID	0.969	0.973	0.971	0.971	0.967	0.96	0.96	0.969	0.955	0.962	0.95	0.952	0.966	0.94	0.938	0.945	0.955	0.959	0.956	0.947	
14 OM451182.1	0.978	0.977	0.978	0.977	0.981	0.98	0.973	0.973	0.976	0.969	0.969	0.969	0.969	ID	0.98	0.977	0.98	0.978	0.973	0.972	0.967	0.96	0.976	0.955	0.964	0.975	0.949	0.949	0.954	0.959	0.962	0.967	0.954	
15 MN449341.1	0.978	0.982	0.978	0.978	0.983	0.985	0.976	0.973	0.976	0.978	0.978	0.973	0.98	ID	0.99	0.987	0.978	0.978	0.973	0.976	0.969	0.959	0.978	0.96	0.966	0.982	0.949	0.944	0.954	0.959	0.962	0.965	0.951	
16 MK201779.1	0.976	0.98	0.976	0.976	0.983	0.985	0.976	0.973	0.978	0.983	0.983	0.983	0.971	0.977	0.99	ID	0.987	0.978	0.973	0.973	0.966	0.959	0.978	0.96	0.969	0.982	0.946	0.941	0.951	0.956	0.962	0.965	0.951	
17 MK201778.1	0.976	0.982	0.981	0.978	0.986	0.987	0.981	0.976	0.978	0.976	0.976	0.976	0.971	0.98	0.987	0.987	ID	0.978	0.975	0.976	0.969	0.956	0.981	0.964	0.969	0.982	0.949	0.946	0.954	0.956	0.96	0.964	0.951	
18 MK201776.1	0.977	0.976	0.975	0.973	0.982	0.978	0.977	0.975	0.975	0.967	0.97	0.97	0.967	0.978	0.978	0.978	0.978	ID	0.987	0.973	0.967	0.956	0.977	0.954	0.97	0.978	0.947	0.947	0.952	0.957	0.961	0.964	0.957	
19 MK201777.1	0.97	0.971	0.975	0.969	0.977	0.976	0.97	0.967	0.972	0.962	0.962	0.962	0.96	0.973	0.973	0.973	0.975	0.987	ID	0.969	0.965	0.951	0.97	0.946	0.965	0.971	0.945	0.945	0.95	0.952	0.956	0.964	0.95	
20 MT610361.1	0.97	0.969	0.971	0.971	0.973	0.976	0.97	0.967	0.972	0.967	0.965	0.965	0.96	0.972	0.976	0.973	0.976	0.973	0.969	ID	0.959	0.954	0.97	0.949	0.959	0.97	0.945	0.945	0.95	0.952	0.954	0.964	0.952	
21 MH747478.1	0.966	0.969	0.967	0.96	0.965	0.969	0.962	0.961	0.965	0.965	0.957	0.957	0.969	0.967	0.969	0.966	0.969	0.967	0.965	0.959	ID	0.961	0.964	0.944	0.95	0.959	0.95	0.951	0.955	0.956	0.961	0.962	0.956	
22 MN337880.1	0.962	0.961	0.954	0.956	0.959	0.959	0.957	0.957	0.957	0.957	0.955	0.955	0.955	0.96	0.959	0.959	0.956	0.956	0.951	0.954	0.961	ID	0.956	0.935	0.944	0.95	0.941	0.941	0.946	0.96	0.961	0.959	0.949	
23 MF062158.1	0.975	0.976	0.977	0.977	0.985	0.981	0.982	0.97	0.977	0.971	0.97	0.97	0.962	0.976	0.978	0.978	0.981	0.977	0.97	0.97	0.964	0.956	ID	0.959	0.965	0.976	0.944	0.941	0.949	0.954	0.957	0.964	0.949	
24 KF924623.1	0.959	0.964	0.954	0.956	0.959	0.957	0.956	0.946	0.951	0.95	0.951	0.951	0.95	0.955	0.96	0.96	0.964	0.954	0.946	0.949	0.944	0.935	0.959	ID	0.941	0.955	0.925	0.923	0.93	0.93	0.938	0.94	0.928	
25 MH052678.1	0.962	0.964	0.965	0.959	0.972	0.969	0.964	0.96	0.965	0.959	0.957	0.957	0.952	0.964	0.966	0.969	0.969	0.97	0.965	0.959	0.95	0.944	0.965	0.941	ID	0.97	0.94	0.94	0.945	0.947	0.951	0.949	0.95	
26 JQ911763.1	0.976	0.975	0.973	0.975	0.986	0.977	0.978	0.971	0.971	0.973	0.973	0.973	0.966	0.975	0.982	0.982	0.982	0.978	0.971	0.97	0.959	0.95	0.976	0.955	0.97	ID	0.951	0.944	0.954	0.954	0.957	0.96	0.949	
27 KM1068050.1	0.95	0.944	0.947	0.946	0.952	0.946	0.942	0.94	0.947	0.942	0.945	0.945	0.94	0.949	0.949	0.946	0.949	0.947	0.945	0.945	0.95	0.941	0.944	0.925	0.94	0.951	ID	0.98	0.99	0.952	0.952	0.949	0.952	
28 KM068049.1	0.95	0.941	0.947	0.944	0.947	0.946	0.945	0.942	0.945	0.94	0.94	0.94	0.938	0.949	0.944	0.941	0.946	0.947	0.945	0.945	0.951	0.941	0.941	0.923	0.94	0.944	0.98	ID	0.977	0.952	0.955	0.946	0.97	
29 KM068051.1	0.955	0.949	0.952	0.951	0.957	0.951	0.947	0.945	0.952	0.947	0.95	0.95	0.945	0.954	0.954	0.951	0.954	0.952	0.95	0.95	0.955	0.946	0.949	0.93	0.945	0.954	0.99	0.977	ID	0.955	0.957	0.954	0.957	
30 JN088541.1	0.955	0.956	0.957	0.952	0.96	0.956	0.952	0.952	0.955	0.955	0.952	0.952	0.955	0.959	0.959	0.956	0.956	0.957	0.952	0.952	0.956	0.96	0.954	0.93	0.947	0.954	0.952	0.952	0.955	ID	0.975	0.956	0.955	
31 JN387133.1	0.964	0.957	0.961	0.955	0.964	0.96	0.956	0.956	0.961	0.959	0.956	0.956	0.959	0.962	0.962	0.962	0.96	0.961	0.956	0.954	0.961	0.961	0.957	0.938	0.951	0.957	0.952	0.955	0.957	ID	0.962	0.962	0.962	
32 KC161964.1	0.971	0.962	0.961	0.964	0.966	0.967	0.959	0.959	0.965	0.962	0.961	0.961	0.956	0.967	0.965	0.965	0.964	0.964	0.961	0.962	0.959	0.964	0.949	0.96	0.949	0.96	0.949	0.964	0.964	0.954	0.956	0.962	ID	0.954
33 KM1068048.1	0.957	0.949	0.952	0.949	0.955	0.954	0.95	0.947	0.95	0.949	0.947	0.947	0.947	0.954	0.951	0.951	0.951	0.957	0.95	0.952	0.956	0.949	0.949	0.928	0.95	0.949	0.952	0.97	0.957	0.955	0.962	0.954	ID	

Supplementary Table 9m Deduced amino acid sequence similarities of the CaKoV 3D gene

Sequences	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
1 PP320363	ID	1	1	0.996	1	1	1	0.996	1	0.996	1	1	0.988	0.996	1	1	1	1	1	1	0.996	0.992	1	0.985	0.996	1	0.988	0.988	0.992	0.996	0.992	1	0.996
2 PP320367	1	ID	1	0.996	1	1	1	0.996	1	0.996	1	1	1	0.988	0.996	1	1																