

Electronic Supplementary Material

Genome analysis of *Heliothis virescens* ascovirus 3h isolated from China

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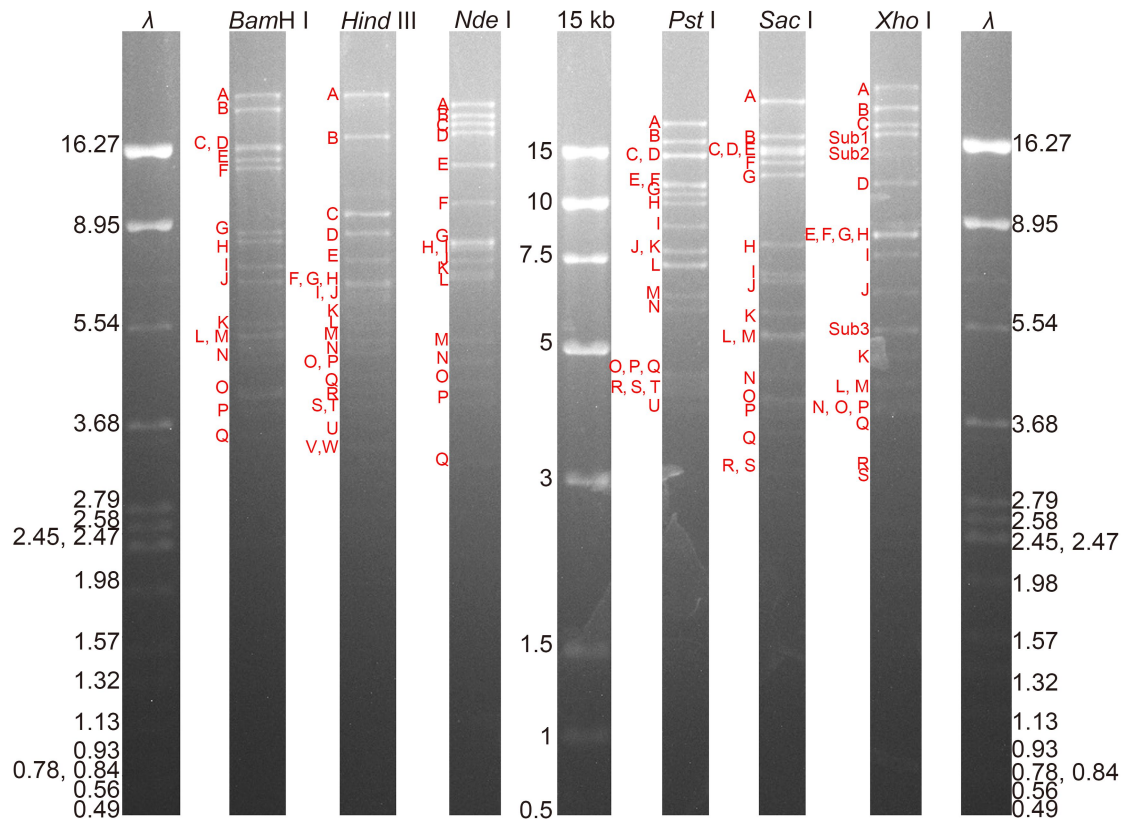


Figure S1. The restriction enzyme digestion profiles of the HvAV-3h genome. The fragments are indicated as A to Y according to the size from the largest to the smallest. Sub1, Sub2 and Sub3 indicate the sub-molar bands.

Table S1. Primers for polymerase chain reaction

Primer name		Sequences (5' to 3')
HvAV-3h_1	forward	GGGCCAGTTTCCCGCACAA
	reverse	ACCGAGTCAGTGAACGCGCC
HvAV-3h_2	forward	TCAACCGCGCCGGACTGTTC
	reverse	ACGCCGTCGGTGTGACGAC
HvAV-3h_11	forward	CGCAACGTTATCGCCGCACG
	reverse	GACATCGTCGGCGCTCTCGG
HvAV-3h_12	forward	ACATGGACCCCGATGCAATTC
	reverse	CCGGTGGTGTTCATTCAAGGA
HvAV-3h_13	forward	CTCCCTCTAGAAACGGTTAGTG
	reverse	ACCACCGTATGACACATTGC

Table S2. Restriction enzyme digestion results of the HvAV-3h genome

	<i>Bam</i> H I	<i>Hind</i> III	<i>Nde</i> I	<i>Pst</i> I	<i>Sac</i> I	<i>Xho</i> I
A	35,071	33,369	25,756	19,178	27,735	37,139
B	25,390	16,998	21,689	15,785	16,831	23,423
C	15,809	8,440	19,446	13,999	15,089	16,842
D	15,429	8,396	17,508	13,962	14,768	11,159
E	13,896	7,345	12,964	11,199	14,400	8,362
F	12,982	6,610	9,950	11,019	13,311	8,351
G	8,511	6,577	8,118	10,411	12,051	8,344
H	8,137	6,503	7,798	9,864	7,972	8,257
I	7,143	6,292	7,703	8,643	6,923	7,546
J	6,657	6,111	7,240	7,597	6,718	6,303
K	5,497	5,622	6,836	7,589	5,828	4,833
L	5,041	5,363	6,684	7,060	5,335	4,367
M	4,948	5,150	5,073	6,185	5,223	4,306
N	4,720	5,053	4,650	5,866	4,509	4,071
O	4,261	4,894	4,240	4,457	3,998	3,984
P	3,938	4,817	3,983	4,426	3,836	3,945
Q	3,572	4,441	3,154	4,325	3,588	3,887
R	2,437	4,253	2,613	4,261	3,072	3,170
S	2,410	3,981	2,232	4,179	3,063	2,980
T	1,855	3,888	2,213	4,121	2,826	2,554
U	1,133	3,679	1,846	3,924	2,559	2,500
V	1,109	3,412	1,715	1,859	2,218	2,474
W	387	3,400	1,102	1,841	2,100	2,326
X	186	3,385	1,075	1,817	1,805	1,721
Y		3,132	1,051	1,716	1,369	1,597
Z		2,649	891	1,666	1,081	1,495
AA		2,598	834	1,185	821	1,431
BB		2401	799	936	727	973
CC		2050	635	877	615	582
DD		1820	452	379	148	473
EE		1682	269	121		452
FF		1505		72		317
GG		1419				237
HH		1174				97
II		747				11
JJ		546				10
KK		397				
LL		231				
MM		189				
Total	190,519	190,519	190,519	190,519	190,519	190,519

Table S3. Annotation of the HvAV-3h genome

HvAV-3h ORFs	Position	aa [#]	Product Description	BLAST best match orthologous orfs number (Id% [§])					
				HvAV-3e	HvAV-3f	HvAV-3g	SfAV-1a	TnAV-6a	DpAV-4a
1*	1 > 3261	1086	DNA polymerase	1(98)	1(98)	1(98)	1(66)	1(44)	1(30)
2	3456 < 4235	259	hypothetical protein	2(97)	2(95)	2(97)	–	84(23)	–
3	4232 < 4846	204	hypothetical protein	3(97)	3(71)	3(96)	2(30)	–	–
4	4892 < 5602	236	hypothetical protein	4(95)	4(84)	4(95)	3(38)	–	–
5	5636 > 6409	257	hypothetical protein	5(99)	5(99)	5(99)	4(72)	164(40)	–
6	6466 > 7029	187	hypothetical protein	6(95)	6(94)	6(95)	–	–	–
7	7310 > 8545	411	hypothetical protein	7(95)	7(92)	7(94)	5(36)	–	–
8	8548 > 9855	435	hypothetical protein	8(96)	8(94)	8(96)	7(39)	21(23)	–
9*	10136 < 12715	859	RNA polymerase subunit	11(99)	10(99)	11(99)	8(79)	42(61)	89(35)
10	13173 > 13835	220	hypothetical protein	12(94)	11(91)	12(93)	–	–	–
11	14052 > 14927	291	bro1	13(96)	12(96)	13(96)	30(39)	–	–
12	14930 > 15226	98	hypothetical protein	14(99)	13(98)	14(99)	–	41(40)	–
13*	15291 > 18125	944	DEAD-like helicase	15(98)	14(98)	15(97)	9(65)	161(43)	20(36)
14	18359 < 19489	376	hypothetical protein	17(95)	15(95)	17(96)	11(37)	160(28)	–
15	19683 > 20576	297	hypothetical protein	18(97)	16(71)	18(97)	12(31)	–	–
16	20699 < 22666	655	lipase like protein	19(97)	17(95)	19(97)	13(48)	–	–
17*	23086 < 24510	474	zinc-dependent metalloprotease	20(96)	19(94)	20(96)	14(59)	158(29)	29(30)
18	24739 > 24900	53	hypothetical protein	21(93)	–	21(92)	–	–	–
19	24976 > 26916	646	hypothetical protein	22(96)	20(88)	22(96)	15(47)	6(31)	–
20*	27150 > 27458	102	<i>iap</i> -like protein-1	23(98)	21(95)	23(98)	16(44)	3(28)	7(33)
21	27539 > 28225	228	hypothetical protein	24(97)	22(98)	24(97)	17(61)	4(30)	–
22	28194 > 28784	196	hypothetical protein	25(98)	23(97)	25(98)	18(59)	5(38)	–
23	29013 > 31337	774	hypothetical protein	26(97)	24(95)	26(97)	20(51)	7(24)	–
24*	31648 > 33834	728	RNasell	27(98)	25(95)	27(98)	22(55)	8(41)	3(35)
25*	33838 > 34578	246	<i>iap</i> -like protein-2	28(99)	26(91)	28(99)	25(40)	9(29)	7(31)
26	34644 < 35048	134	hypothetical protein	29(99)	27(95)	29(99)	26(48)	10(36)	–
27	35064 < 37343	759	hypothetical protein	30(98)	28(94)	30(98)	27(44)	11(30)	–
28	37443 > 38507	354	hypothetical protein	31(99)	29(97)	31(98)	28(36)	–	–
29	38550 > 38846	98	hypothetical protein	32(99)	30(98)	32(99)	–	13(40)	–
30*	38941 > 40116	391	poxvirus late transcription factor VLTF3 like protein	33(97)	31(97)	33(97)	29(70)	17(53)	103(25)
31	40201 < 41181	326	hypothetical protein	34(96)	32(91)	34(92)	32(33)	26(34)	–
32	41257 > 41814	185	hypothetical protein	36(93)	33(92)	36(96)	–	–	–
33	41899 > 42321	140	hypothetical protein	37(96)	34(98)	37(96)	–	–	–
34	42403 < 43311	302	hypothetical protein	39(91)	35(90)	38(92)	32(34)	26(38)	–
35	43846 > 44565	239	bro2	42(29)	36(94)	40(95)	72(26)	137(26)	–
36	44635 > 45399	254	bro3	42(33)	37(88)	42(93)	–	27(27)	–
37	45418 > 46284	288	bro4	42(78)	38(68)	43(77)	80(54)	137(39)	4(23)
38	46341 > 47420	359	bro5	40(78)	41(81)	44(74)	79(62)	165(65)	110(24)

To be continued

39	47510 > 48529	339	bro6	41(86)	40(73)	47(97)	79(64)	165(70)	98(22)
40	48619 > 49665	348	bro7	43(88)	41(79)	44(86)	79(63)	165(62)	17(24)
41	49782 > 50243	153	bro8	44(93)	42(84)	48(94)	79(34)	165(37)	–
42	50305 > 51009	234	hypothetical protein	45(94)	43(92)	49(96)	78(53)	–	–
43	51179 > 51880	233	hypothetical protein	46(98)	44(93)	50(98)	33(54)	18(27)	–
44	51889 > 52194	101	hypothetical protein	47(96)	45(98)	51(97)	–	–	–
45	52227 > 52469	80	hypothetical protein	48(98)	46(98)	52(98)	–	–	–
46	52522 < 53295	257	hypothetical protein	49(96)	47(96)	53(95)	–	34(32)	–
47	53416 > 54231	271	<i>iap</i> -like protein–3	51(96)	49(95)	55(96)	74(42)	32(44)	–
48*	54330 > 55790	486	hypothetical protein	52(96)	50(91)	56(96)	36(50)	157(29)	40(19)%
49	55699 < 56031	110	GIY–YIG–like endonuclease	–	–	–	37(65)	87(46)	77(49)
50*	56102 < 56671	189	hypothetical protein	53(97)	52(83)	58(97)	38(56)	156(70)	63(33)
51	56685 > 57308	207	hypothetical protein	–	–	–	39(41)	–	–
52*	57207 < 57860	217	thymidine kinase	55(98)	54(96)	60(98)	40(55)	154(33)	55(29)
53*	57905 > 59272	455	major capsid protein	56(99)	55(97)	61(99)	41(68)	153(34)	19(23)
54*	59343 < 60077	244	hypothetical protein	57(92)	56(94)	62(92)	42(46)	150(37)	60(35)%
55	60091 < 60768	225	hypothetical protein	58(99)	57(99)	63(99)	43(73)	149(32)	–
56	60809 < 61537	242	hypothetical protein	59(94)	58(94)	64(95)	–	148(43)	23(28)
57	61572 < 65825	1417	chromosome segregation SMC like protein	60(95)	59(94)	65(96)	46(35)	–	–
58*	66015 < 67856	613	cofactor of the virion S/T kinase encoded by thioredoxin	61(96)	60(94)	66(95)	48(68)	141(31)	8(28)
59	67889 < 68407	172	putative nucleic acid– binding protein	62(97)	61(97)	67(98)	49(45)	–	–
60	68502 < 69194	230	<i>iap</i> -like protein–4	63(97)	62(92)	69(98)	51(52)	–	–
61*	69296 > 72763	1155	RNA polymerase subunit	64(99)	63(98)	70(99)	52(81)	138(58)	73(41)
62*	72811 > 73689	292	myristylated membrane protein–like protein	65(26)%	64(98)	71(98)	54(60)	129(34)	65(28)
63*	73703 > 74608	301	hypothetical protein	66(98)	65(97)	72(97)	55(67)	126(40)	35(28)
64*	74724 > 76007	427	hypothetical protein	68(96)	66(95)	74(96)	56(44)	125(42)	64(32)
65*	75981 < 76742	253	hypothetical protein	69(96)	67(97)	75(96)	57(54)	124(40)	9(22)%
66	76820 < 77932	370	hypothetical protein	70(97)	68(97)	76(98)	58(47)	122(34)	–
67*	77933 < 79132	399	DNA repair exonuclease	71(98)	69(98)	77(99)	59(61)	121(50)	26(37)
68	79169 > 79429	86	hypothetical protein	–	70(95)	78(99)	–	120(39)	–
69	79437 > 79673	78	hypothetical protein	72(97)	71(90)	79(97)	60(63)	–	–
70	79816 < 80070	84	hypothetical protein	73(99)	72(100)	80(100)	–	–	–
71*	80142 > 80768	208	sulfhydryl oxidase Erv1 like protein	74(96)	73(95)	81(96)	61(49)	118(33)	41(30)
72	80785 > 81252	155	phenylalanyl–tRNA synthetase α subunit	75(96)	74(94)	82(96)	–	117(31)	–
73	81249 < 81482	77	hypothetical protein	–	–	83(94)	62(76)	–	–
74	81465 > 81989	174	hypothetical protein	76(95)	75(98)	84(95)	63(46)	116(36)	–
75*	82035 > 84473	812	serine/threonine protein kinase	77(98)	76(98)	85(98)	64(53)	115(27)	46(24)
76*	84583 > 85797	404	hypothetical protein	78(94)	77(96)	86(94)	65(49)	113(33)	43(25)
77	85852 > 86103	83	hypothetical protein	79(99)	78(96)	87(99)	–	–	–
78	86157 < 87149	330	nuclease	80(97)	79(96)	88(97)	66(54)	112(38)	–

To be continued

79	87189 < 87566	125	hypothetical protein	81(97)	80(98)	89(96)	–	–	
80*	87588 > 88937	449	RNA polymerase subunit	82(98)	81(97)	90(98)	67(61)	110(52)	70(30)
81	89208 > 89942	244	hypothetical protein	83(99)	82(98)	91(99)	68(43)	159(24)	–
82	90087 > 91070	327	hypothetical protein	85(98)	83(95)	92(99)	–	–	–
83*	91150 < 91608	152	glycosyltransferase	86(100)	84(95)	93(100)	119(35)	107(45)	52(34)
84*	91614 < 92309	231	ABC-type transport system permease	87(94)	85(92)	94(94)	119(44)	107(44)	52(25)
85	92863 < 93132	89	aegerolysin	–	87(83)	–	–	29(69)	–
86	93184 < 93510	108	hypothetical protein	–	–	–	–	–	–
87	93765 > 94262	165	crystal superfamily	–	–	96(94)	–	–	–
88	94285 > 95067	260	putative S1/P1 nuclease	134(37)	89(91)	148(37)	75(41)	135(37)	–
89	95073 > 95849	258	hypothetical protein	–	91(73)	–	–	–	–
90	96020 < 96838	272	<i>iap</i> -like protein-5	89(85)	93(56)	97(74)	–	–	–
91	96847 < 98334	495	bro9	90(76)	94(84)	98(94)	79(46)	165(46)	98(29)
92	99124 > 101097	657	hypothetical protein	–	–	–	–	–	–
93	101371 > 102309	312	gamma-glutamyl hydrolase-like protein	–	162(52)	99(95)	–	–	–
94	102460 < 104010	516	bro10	92(86)	96(81)	100(99)	79(48)	165(41)	34(33)
95	104416 > 104799	127	hypothetical protein	96(52)	92(92)	101(100)	78(29)	–	–
96	104926 < 105156	76	hypothetical protein	–	–	–	–	–	–
97	105319 < 106827	502	bro11	93(98)	97(81)	102(97)	70(86)	165(29)	75(29)
98	107101 > 107325	74	hypothetical protein	–	98(93)	–	–	–	–
99	107359 < 107625	88	hypothetical protein	–	100(91)	105(98)	–	–	–
100	107626 > 108231	201	nicotinate-nucleotide pyrophosphorylase NAD-glutamate dehydrogenase	94(90)	99(55)	106(93)	–	136(55)	–
101	108420 > 108965	181	hypothetical protein	95(99)	102(77)	107(99)	76(28)	–	–
102	109065 < 109457	130	hypothetical protein	96(99)	92(51)	108(99)	78(26)	–	–
103	109528 < 109740	70	hypothetical protein	97(96)	103(96)	109(96)	–	–	–
104	110148 > 110618	156	bro12	98(98)	104(94)	110(97)	–	–	–
105	110656 > 110901	81	hypothetical protein	99(94)	–	111(95)	–	–	–
106	110942 < 111634	230	hypothetical protein	101(97)	105(90)	112(97)	–	–	–
107	111721 < 112212	163	thioredoxin-like protein	102(99)	106(99)	113(99)	116(51)	103(34)	–
108	112251 > 112895	214	hypothetical protein	–	–	114(96)	–	–	–
109*	112798 < 114033	411	cathepsin B	103(95)	107(92)	115(95)	114(52)	102(38)	48(31)
110	114056 < 114697	213	hypothetical protein	–	108(88)	116(98)	–	–	–
111*	114753 > 115304	183	putative zinc-finger DNA binding protein	105(97)	109(94)	117(97)	113(42)	100(36)	108(33)
112	115368 < 115601	77	transcription elongation factor S-II	–	110(100)	118(100)	–	99(59)	82(44)
113*	115612 > 116649	345	lysophospholipid acetyltransferase	106(97)	111(95)	119(97)	112(48)	98(41)	81(26)
114	116650 > 116895	81	lectin-like protein	107(99)	112(85)	120(99)	–	–	–
115	117019 > 118821	600	hypothetical protein	108(97)	113(94)	121(97)	–	96(34)	–
116*	118944 > 120014	356	ATPase involved in DNA metabolism	109(98)	114(97)	122(98)	110(73)	95(61)	86(47)

To be continued

117*	120111 > 120680	189	CDT phosphatase transcription factor	110(99)	115(98)	123(99)	109(69)	93(52)	117(34)
118*	120730 > 121236	168	hypothetical protein	111(98)	116(99)	124(98)	108(63)	91(41)	97(29)
119	121334 < 122080	248	hypothetical protein	112(97)	117(96)	125(97)	–	84(38)	–
120	122496 > 122975	159	bro13	113(93)	118(94)	127(93)	–	–	–
121	123169 > 123732	187	hypothetical protein	114(98)	119(92)	128(98)	–	–	–
122	124002 > 124427	141	hypothetical protein	115(99)	120(91)	129(99)	107(42)	–	–
123	124507 > 125022	171	bro14	116(99)	121(90)	130(98)	–	–	–
124*	125522 < 127492	656	serine/threonine protein kinase	117(98)	122(98)	131(98)	104(63)	88(42)	36(30)
125*	127637 > 130294	885	ATPase involved in DNA repair	118(97)	123(97)	132(97)	103(41)	77(33)	33(26)
126*	130549 > 133707	1052	ATPase involved in DNA replication	119(99)	124(98)	133(98)	99(78)	78(45)	93(29)
127	133919 < 134410	163	BRCA1 like protein	120(98)	125(95)	134(98)	97(62)	80(29)	–
128	134438 < 135244	268	hypothetical protein	121(97)	126(95)	135(97)	96(32)	–	–
129	135347 > 136873	508	helicase	122(95)	127(88)	136(95)	95(67)	82(39)	–
130	136935 < 138371	478	bro15	123(98)	128(70)	137(76)	70(27)	–	34(29)
131	138520 < 139107	195	bro16	150(40)	97(50)	139(83)	79(32)	165(29)	34(29)
132	139265 < 140152	295	hypothetical protein	127(95)	131(85)	141(94)	94(25)	–	–
133*	140305 > 141231	308	patatin-like phospholipase	128(98)	132(98)	142(96)	93(72)	67(49)	87(27)
134*	141291 < 141950	219	hypothetical protein	129(100)	133(100)	143(99)	92(76)	60(54)	116(24)
135*	142269 > 142646	125	yabby-like transcription factor	130(100)	134(100)	144(100)	91(84)	59(61)	22(29)
136	142737 < 145694	985	lipopolysaccharide modifying enzyme	131(98)	135(97)	145(98)	90(54)	58(35)	–
137	145736 > 146218	160	hemolysin-like protein	132(98)	136(99)	146(98)	–	57(30)	–
138	146215 < 146679	154	hypothetical protein	133(98)	137(96)	147(99)	–	–	–
139	146711 < 147544	277	putative S1/P1 nuclease	134(99)	138(95)	148(99)	75(42)	135(68)	–
140	147676 < 148314	212	hypothetical protein	135(99)	139(99)	149(99)	–	54(42)	–
141	148373 > 148816	147	hypothetical protein	136(91)	140(93)	150(91)	–	–	–
142	148902 < 149483	193	hypothetical protein	137(97)	141(94)	151(97)	–	52(35)	–
143*	149517 < 150155	212	RNA polymerase subunit	138(98)	142(98)	152(98)	89(51)	51(29)	10(26) [%]
144	150188 < 150883	231	hypothetical protein	139(96)	143(95)	153(96)	88(41)	–	–
145	150870 < 151187	105	hypothetical protein	–	144(88)	–	–	–	–
146*	151252 > 152064	270	fatty acid elongase	140(99)	145(98)	154(99)	87(70)	46(48)	15(34)
147	152099 > 152794	231	DEAD-like helicase	141(91)	146(90)	155(92)	–	45(29)	–
148	153097 > 153723	208	hypothetical protein	142(95)	147(89)	156(94)	–	–	–
149	153887 < 154303	138	hypothetical protein	143(89)	148(90)	157(88)	–	–	–
150	154409 > 155110	233	Uyr/REP helicase	144(98)	149(98)	158(98)	86(65)	–	28(42)
151	155175 < 155786	203	hypothetical protein	145(95)	150(97)	159(96)	85(50)	–	–
152*	155844 > 159617	1257	Dynein-like β chain	146(99)	151(98)	160(99)	84(64)	43(34)	85(23)
153	159843 > 160766	307	hypothetical protein	148(95)	152(87)	161(93)	–	68(60)	–
154	160883 < 162403	506	bro17	149(77)	153(69)	162(88)	70(27)	165(31)	98(30)
155	162640 < 164091	483	bro18	149(75)	154(79)	162(69)	70(27)	165(27)	67(30)
156	164415 < 165569	384	hypothetical protein	–	101(92)	–	–	–	–
157*	165772 < 166293	173	tyrosyl-DNA phosphodiesterase	151(90)	160(87)	164(96)	119(61)	162(38)	52(29)

To be continued

158*	166315 < 166827	170	hypothetical protein	152(92)	161(89)	165(93)	119(32)	162(35)	52(26)
159	166957 > 167190	77	hypothetical protein	–	–	–	–	–	–
160	167208 < 168773	521	bro19	153(96)	163(89)	166(93)	79(45)	137(45)	34(28)
161	169273 > 169788	171	bro20	154(90)	164(77)	167(90)	79(45)	137(43)	98(28)
162	169835 > 170134	99	bro21	–	166(86)	43(31)	–	–	–
163	170259 > 171353	364	bro22	157(98)	167(91)	169(90)	79(67)	165(83)	32(26)
164	171656 < 172540	294	hypothetical protein	158(94)	168(95)	170(96)	117(38)	–	–
165	172736 < 173089	117	hypothetical protein	159(83)	169(88)	171(83)	–	–	–
166	173155 > 173700	181	hypothetical protein	160(95)	170(85)	172(96)	–	–	–
167	174138 > 174620	160	RING–finger–containing E3 ubiquitin ligase	161(91)	172(98)	175(92)	–	–	–
168	174608 > 175123	171	hypothetical protein	162(91)	173(91)	176(91)	–	–	–
169	175201 > 176178	325	hypothetical protein	163(92)	174(91)	177(92)	30(38)	–	–
170	176262 > 176540	92	hypothetical protein	164(85)	175(89)	178(90)	–	–	–
171	177151 < 178095	314	caspase–like protein	165(91)	176(94)	179(93)	73(37)	72(22)	–
172	178429 > 179121	230	bro23	166(94)	177(95)	180(95)	72(32)	137(28)	75(24)
173	179156 > 179908	250	bro24	167(89)	178(94)	181(95)	30(32)	–	–
174	179966 < 180838	290	hypothetical protein	168(95)	181(95)	182(93)	–	35(36)	–
175	181107 > 181631	174	RING–finger–containing E3 ubiquitin ligase	169(92)	–	183(97)	81(41)	–	–
176	181508 < 182572	354	DUF2661 superfamily	–	182(93)	185(91)	–	–	78(27)
177	182672 > 184042	456	S–TKc serine/threonine protein kinase	170(96)	183(96)	186(96)	82(33)	–	–
178	184076 > 185143	355	hypothetical protein	171(94)	184(92)	187(93)	83(29)	–	–
179	185278 < 185715	145	hypothetical protein	172(89)	185(92)	188(92)	–	–	–
180	185773 < 186219	148	hypothetical protein	173(95)	186(97)	189(95)	–	35(26)	–
181	186437 > 186772	111	hypothetical protein	174(97)	187(98)	190(97)	–	–	–
182	186974 < 188161	395	hypothetical protein	175(98)	188(94)	191(97)	–	–	–
183	188363 < 188578	71	hypothetical protein	–	–	192(96)	–	–	–
184	188784 < 189602	272	hypothetical protein	177(92)	189(90)	193(92)	123(32)	–	–
185	189703 < 190365	220	hypothetical protein	–	190(88)	194(88)	–	–	–

Note: # The length of amino acid; § Amino acid identity with the homologue of HvAV-3h; * Conserved *Ascoviridae* proteins except *bro* genes; % indicates the low query cover and high E value. *hrs*, homologous regions; ORF, open reading frame; *bro*, baculovirus repeat ORFs; *iap*, inhibitor of apoptosis protein; SfAV, *Spodoptera frugiperda* ascovirus; TnAV, *Trichoplusia ni* ascovirus; HvAV, *Heliothis virescens* ascovirus; DpAV, *Diadromus pulchellus* ascovirus; kbp, kilo base pairs.