

Supplementary Table S1. CPR family genes.

Gene Name	Stock center	Stock number	Inserted chromosome	Lethality (<i>GMR-Gal4</i> × <i>UAS-RNAi</i>)	Protrusion type
<i>Acp1</i>	NIG	7216R-2	3	+	+
<i>Acp1</i>	NIG	7216R-3	1	+	+
<i>CG17707</i>	NIG	17707R-2	3	+	+
<i>CG17707</i>	NIG	17707R-3	2	+	+
<i>Cpr</i>	NIG	11567R-1	3	+	+
<i>Cpr</i>	NIG	11567R-4	3	+	+
<i>Cpr5C</i>	VDRC	7078	2	+	+
<i>Cpr11A</i>	NIG	2560R-2	2	+	+
<i>Cpr11A</i>	NIG	2560R-4	2	+	+
<i>Cpr11B</i>	NIG	2555R-1	3	+	+
<i>Cpr11B</i>	NIG	2555R-4	3	+	+
<i>Cpr12A</i>	VDRC	38072	3	+	+
<i>Cpr23B</i>	NIG	2973R-1	1	pupal lethal	no-protrusion (at the margin), enlarged
<i>Cpr23B</i>	NIG	2973R-6	2	+	+
<i>Cpr30B</i>	NIG	3818R-1	1	+	+
<i>Cpr30B</i>	NIG	3818R-2	3	+	+
<i>Cpr30F</i>	VDRC	37987	1	+	+
<i>Cpr31A</i>	VDRC	12386	2	+	+
<i>Cpr35B</i>	NIG	3474R-1	2	+	+
<i>Cpr35B</i>	NIG	3474R-2	2	+	+
<i>Cpr47Ea</i>	NIG	9079R-2	2	+	+
<i>Cpr47Ea</i>	NIG	9079R-8	3	+	+
<i>Cpr47Ea</i>	VDRC	28733	3	+	+
<i>Cpr47Eb</i>	NIG	13224R-1	2	+	+
<i>Cpr47Eb</i>	NIG	13224R-2	1	+	+
<i>Cpr47Ec (Cpr47eg)</i>	VDRC	12526	3	+	+
<i>Cpr47Ed</i>	VDRC	12529	3	+	+
<i>Cpr47Ee</i>	NIG	13222R-1	3	+	+
<i>Cpr47Ee</i>	NIG	13222R-4	2	+	+
<i>Cpr47Ef</i>	NIG	13214R-1	3	+	+
<i>Cpr47Ef</i>	NIG	13214R-2	2	+	+
<i>Cpr47Eg (Lcp2a)</i>	VDRC	3262	3	+	+
<i>Cpr49Ab</i>	VDRC	2696	2	+	+
<i>Cpr49Ac</i>	VDRC	37421	3	+	+
<i>Cpr49Ad</i>	NIG	8836R-2	3	+	+
<i>Cpr49Ad</i>	NIG	8836R-3	2	+	+
<i>Cpr49Ad</i>	VDRC	51559	3	+	+
<i>Cpr49Af</i>	NIG	8510R-2	3	+	+
<i>Cpr49Af</i>	NIG	8510R-4	2	+	+
<i>Cpr49Af</i>	VDRC	45105	2	+	+
<i>Cpr49Ag</i>	NIG	8511R-2	3	+	+
<i>Cpr49Ag</i>	NIG	8511R-4	2	+	+
<i>Cpr49Ag</i>	VDRC	35708	3	+	+
<i>Cpr49Ah</i>	NIG	8515R-1	3	+	no-protrusion (at the margin), grainy, maze
<i>Cpr49Ah</i>	NIG	8515R-2	2	+	+
<i>Cpr49Ah</i>	VDRC	23183	2	+	grainy, maze
<i>Cpr50Ca</i>	NIG	13338R-1	2	+	+
<i>Cpr50Ca</i>	NIG	13338R-3	1	+	+
<i>Cpr50Cb</i>	VDRC	7542	3	+	+
<i>Cpr51A</i>	VDRC	13971	3	+	+
<i>Cpr57A</i>	VDRC	16858	2	+	+
<i>Cpr60D</i>	VDRC	17896	2	+	+
<i>Cpr62Ba</i>	NIG	13934R-2	2	+	+
<i>Cpr62Bb</i>	NIG	13935R-3	3	+	+
<i>Cpr62Bb</i>	NIG	13935R-4	2	+	+
<i>Cpr62Bc</i>	VDRC	15265	3	+	+

Supplementary Table S1. Continued.

Gene Name	Stock center	Stock number	Inserted chromosome	Lethality (<i>GMR-Gal4</i> × <i>UAS-RNAi</i>)	Protrusion type
<i>Cpr64Aa</i>	NIG	15006R-1	3	+	+
<i>Cpr64Aa</i>	NIG	15006R-2	1	+	+
<i>Cpr64Ab</i>	VDRC	7486	3	+	+
<i>Cpr64Ac</i>	NIG	15008R-1	2	+	+
<i>Cpr64Ac</i>	NIG	15008R-2	3	+	+
<i>Cpr64Ad</i>	NIG	1259R-1	3	+	+
<i>Cpr64Ad</i>	NIG	1259R-3	2	+	+
<i>Cpr65Au</i>	VDRC	37484	3	+	+
<i>Cpr65Av</i>	VDRC	23328	2	+	+
<i>Cpr65Ax2</i>	VDRC	37797	3	+	+
<i>Cpr65Az</i>	VDRC	16844	2	+	+
<i>Cpr65Ea</i>	VDRC	14028	2	+	+
<i>Cpr65Eb</i>	NIG	8638R-1	3	+	+
<i>Cpr65Eb</i>	NIG	8638R-3	2	+	+
<i>Cpr65Eb</i>	VDRC	35992	3	+	+
<i>Cpr65Ec</i>	NIG	8634R-1	3	+	+
<i>Cpr65Ec</i>	NIG	8634R-2	2	+	+
<i>Cpr66Ca</i>	VDRC	16843	2	+	+
<i>Cpr66Cb</i>	NIG	7076R-2	3	+	+
<i>Cpr66Cb</i>	NIG	7076R-3	3	+	+
<i>Cpr66D</i>	VDRC	52275	3	+	+
<i>Cpr67B</i>	NIG	3672R-1	3	+	+
<i>Cpr67Fa1</i>	NIG	7941R-1	3	+	+
<i>Cpr67Fa1</i>	NIG	7941R-8	3	+	+
<i>Cpr67Fa2</i>	NIG	18349R-2	3	+	+
<i>Cpr67Fa2</i>	NIG	18349R-3	3	+	+
<i>Cpr67Fb</i>	VDRC	43244	3	+	+
<i>Cpr72Ea</i>	NIG	4818R-3	2	+	+
<i>Cpr72Ea</i>	NIG	4818R-6	2	+	+
<i>Cpr72Eb</i>	VDRC	14243	3	+	+
<i>Cpr72Ec</i>	NIG	4784R-2	3	+	+
<i>Cpr73D</i>	VDRC	23720	3	+	+
<i>Cpr76Ba</i>	VDRC	15222	2	+	+
<i>Cpr76Bb</i>	VDRC	14349	2	+	+
<i>Cpr76Bc</i>	VDRC	45803	1	+	+
<i>Cpr76Bd</i>	NIG	9299R-1	2	+	+
<i>Cpr76Bd</i>	NIG	9299R-2	3	+	+
<i>Cpr76Bd</i>	VDRC	47985	2	+	+
<i>Cpr78Ca</i>	NIG	11310R-1	3	+	+
<i>Cpr78Cb</i>	VDRC	31058	1	+	+
<i>Cpr78Cc</i>	VDRC	31059	1	+	+
<i>Cpr78E</i>	NIG	7160R-1	3	+	+
<i>Cpr78E</i>	NIG	7160R-3	3	+	+
<i>Cpr92A</i>	NIG	6240R-2	2	+	+
<i>Cpr92A</i>	NIG	6240R-3	3	+	+
<i>Cpr92F</i>	NIG	5494R-1	2	+	+
<i>Cpr92F</i>	NIG	5494R-3	3	+	+
<i>Cpr97Ea</i>	NIG	6131R-1	2	+	+
<i>Cpr97Ea</i>	NIG	6131R-2	2	+	+
<i>Cpr97Eb</i>	VDRC	19545	3	+	+
<i>Cpr100A</i>	VDRC	31083	3	+	+

Lethality +: viable, pupal lethal; the F1 progeny showed lethality at the pharate adult stage.

Protrusion type +: normal type.

Supplementary Table S2. Genes that affect cuticle development (chitin assembly, sclerotization and melanization, secretion, ecdysone signaling, cell polarity).

Categories	Gene Name	Stock center	Stock number	Inserted chromosome	molecular function	Lethality (GMR-Gal4 × UAS-RNAi)	Protrusion type
chitin assembly	<i>mmy</i>	NIG	9535R-1	3	UDP-GlcNAc pyrophosphorylase	+	+
		NIG	9535R-2	3		+	+
	<i>kkv</i>	VDRC	42611	2	Chitin Synthase-1	pupal lethal	n.a.
		VDRC	100327	2		pupal lethal	n.a.
	<i>rtv</i>	VDRC	5538	3	Apical membrane-anchored extracellular proteins	+	+
	<i>knk</i>	NIG	6217R-3	3	Apical membrane-anchored extracellular proteins	+	+
		NIG	6217R-4	3		+	+
	<i>pio</i>	NIG	3541R-1	2	membrane-associated protein	+	+
		NIG	3541R-3	3		+	+
	<i>verm</i>	NIG	8756R-1	3	Chitin deacetylase	+	+
		NIG	8756R-4	3		+	+
	<i>serp</i>	NIG	11331R-1	3	Chitin deacetylase	+	+
		NIG	11331R-3	3		+	+
		<i>slf</i>	NIG	5406R-2	2	Unknown (Chitin architecture)	+
		NIG	5406R-3	3		+	+
sclerotisation and melanisation	<i>ple</i>	VDRC	3308	2	Tyrosine hydroxylase	+	+
		VDRC	108879	2		+	+
	<i>Ddc</i>	NIG	10697R-1	1	Dopa decarboxylase	+	+
		NIG	10697R-2	3		+	+
	<i>e</i>	NIG	3331R-1	3	β-alanyl dopamine synthase	+	+
		NIG	3331R-3	2		+	+
	<i>b</i>	NIG	7811R-1	2	Glutamate decarboxylase 2	+	+
	<i>t</i>	NIG	6586R-1	2	NBAD hydrolase	+	+
		NIG	6586R-2	2		+	+
	<i>svr</i>	NIG	4122R-2	3	Carboxypeptidase D	+	+
	<i>y</i>	NIG	3757R-1	3	Dopachrome-conversion enzymes	+	+
	NIG	3757R-5	2		+	+	
secretion	<i>Syx 1A</i>	NIG	5448R-3	2	SNARE binding protein	+	+
		NIG	5448R-4	3		+	no-protrusion (at the margin), grainy, fusion, enlarged
	<i>Sec61β</i>	VDRC	8785	3	subunit of Sec61	+	+
		VDRC	108454	2		pupal lethal	no-protrusion (at the margin), enlarged
	<i>γCOP</i>	VDRC	25101	2	component protein of the COP I complex	pupal lethal	n.a.
	<i>Sar1</i>	VDRC	34192	3	component proteins of the COP II complex	pupal lethal	n.a.
		VDRC	108458	2		pupal lethal	n.a.
	<i>Sec31</i>	NIG	8266R-1	3	component protein of the COP II complex	+	+
	<i>hau</i>	VDRC	24552	3	component protein of the COP II complex	pupal lethal	n.a.
	<i>Sec23</i>	NIG	1250R-1	2	component protein of the COP II complex	pupal lethal	n.a.
<i>gho</i>	VDRC	37543	2	component protein of the COP II complex	pupal lethal	n.a.	
	VDRC	106929	2		pupal lethal	n.a.	
ecdysone signaling	<i>EcR</i>	Bloomington 9326		2	Ecdysone signalling targets	+	+
		Bloomington 9327		2		+	no-protrusion (at the margin), grainy, maze
	<i>Bimp-1</i>	NIG	5249 R-1	3	Transcriptional repressor activity	+	no-protrusion
		NIG	5249 R-2	3		+	no-protrusion
<i>sro</i>	VDRC	16386	3	Glucose/ribitol dehydrogenase	+	grainy, enlarged	
	VDRC	50111	2		+	+	
cell polarity/cell architecture	<i>Act5C</i>	VDRC	7139	2	Structure constituent of cytoskeleton	+	grainy, fusion, enlarged
		VDRC	7140	3		+	+
		NIG	HMS02487	3		+	grainy, fusion, enlarged
	<i>shg</i>	NIG	3722 R-2	2	Cell adhesion molecule binding (AJ)	+	no-protrusion (at the margin), grainy, fusion, enlarged
	<i>arm</i>	NIG	11579 R-1	3	Cell adhesion molecule binding (AJ)	+	grainy, fusion, enlarged
		NIG	11579 R-2	3		+	grainy, fusion, enlarged
	<i>crb</i>	NIG	6383 R-2	3	Transmembrane protein controlling cell polarity	+	+
	<i>dlg1</i>	NIG	1725 R-1	3	Structural molecule activity (SJ)	+	+
		NIG	1725 R-2	2		+	no-protrusion (at the margin)
	<i>coracle</i>	VDRC	9787	2	Cytoskeletal protein binding (SJ)	+	no-protrusion (at the center)
	VDRC	9788	3		+	no-protrusion (at the center)	
	VDRC	108749	2		+	no-protrusion (at the center)	

Lethality +: viable, pupal lethal: the F1 progeny showed lethality at the pharate adult stage.

Protrusion type +: normal type, n.a.: not analyzed.

AJ: adherens junction, SJ: septate junction.