Supplementary information:

Novel mutations and mutation combinations of ryanodine receptor confers resistance to chlorantraniliprole in a field population of *Plutella xylostella* (L.)

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Table S1. Location and sequences of primers used for the amplification of full length RyR cDNA from the *P. xylostella*

Number	Position	Primer sequence	Length of products (bp)
1	1	ATG GCG GAA GCG GAA GGG	970
	970	TTC TGG TCA TCC TTC TCT TG	
2	911	GAG AGG AAG CCA CAA CAG	1478
	2388	GAA ACG GCA ACT CAA CTT G	
3	2266	ACG GTG CCT ATA ATC AAC TT	1473
	3738	GTC CTT CGT GTA CCA GTG	
4	3518	AGT TGC TAA TGG ATG CCC TC	1490
	5007	CGT TTC TGG CTC CAT ACT G	
5	4804	AGA GTT ATA CGC AGT GTG AA	1476
	6279	GCA CGG GAT GTT CTC TTT	
6	6036	GCA CCA TCT CAA CGA CAT	1490
	7525	TGT AGT CTT CAT CCT CAT CTG	
7	7416	CAA GAT GAG TGA GAA GAT AGC	1474
	8889	TGG GTG AGG GTT GTA GTT	
8	8661	GCG ACT GAA GCC TTA CAA	1479
	10139	GAG TAA GTC TTG TCC GAG TC	
9	9983	ATC TCA ACA AGC ACA ACC A	1466
	11448	CTT CAG TTC GGC GTC TTC	
10	11247	GTA TCG GTC TGT GGT GTC	1460
	12706	GCT GTT CCA TCT TCT CCT T	
11	12512	GTT AAT GGC ACA ATC GGT AA	691
	13202	ATA CAT ATA CGC CGC TTC C	
12	13225	GTG ATG ATG ATG ATG ACA GTC	1556
	14780	GAT GAT GGT GAG CAG CAT	
13	14596	ACA ACT CGT TCC TAT ACT CTC	759
	15354	CTA CTC TCC CAT GGC GTC CTC	

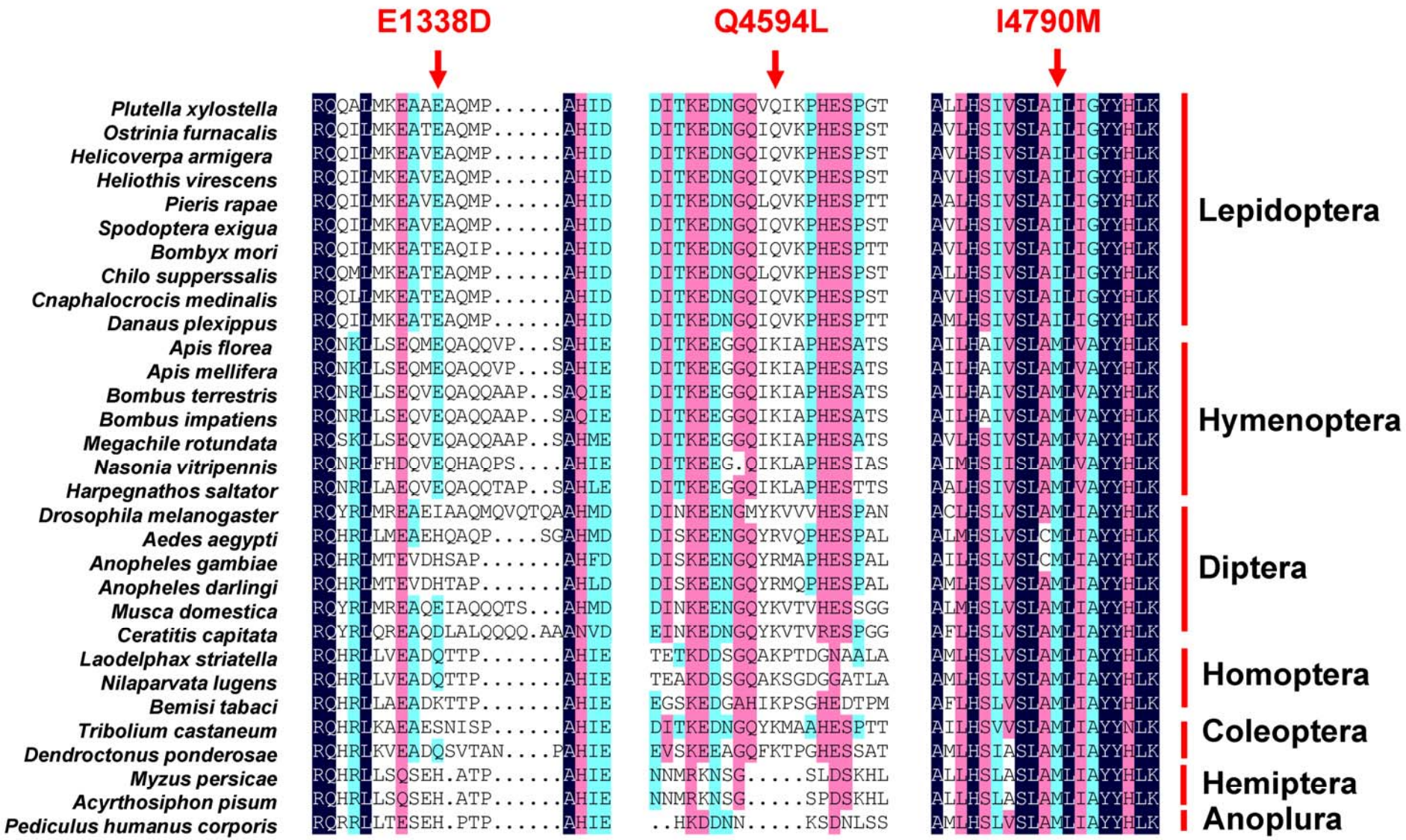
E1338D
Q4594L
I4790M
Plutella xylostella RQQALMKEAAEAQMP.....AHID DITKEDNGQVQIKPHESPGT ALLHSIVSLAILIGYYHLK
Ostrinia furnacalis RQQILMKEATEAQMP.....AHID DITKEDNGQIQVKPHESPST AVLHSIVSLAILIGYYHLK
Helicoverpa armigera RQQILMKEAVEAQMP.....AHID DITKEDNGQIQVKPHESPST AVLHSIVSLAILIGYYHLK
Heliothis virescens RQQILMKEAVEAQMP.....AHID DITKEDNGQIQVKPHESPST AVLHSIVSLAILIGYYHLK
Pieris rapae RQQILMKEAVEAQMP.....AHID DITKEDNGQLQVKPHESPTT AALHSIVSLAILIGYYHLK
Spodoptera exigua RQQILMKEAVEAQMP.....AHID DITKEDNGQIQVKPHESPST AVLHSIVSLAILIGYYHLK
Bombyx mori RQQILMKEATEAQIP.....AHID DITKEDNGQIQVKPHESPTT AVLHSIVSLAILIGYYHLK
Chilo supperssalis RQQMLMKEATEAQMP.....AHID DITKEDNGQLQVKPHESPST ALLHSIVSLAILIGYYHLK
Cnaphalocrocis medinalis RQQLLMKEATEAQMP.....AHID DITKEDNGQIQVKPHESPST AVLHSIVSLAILIGYYHLK
Danaus plexippus RQQILMKEATEAQMP.....AHID DITKEDNGQIQVKPHESPTT AMLHSIVSLAILIGYYHLK
Apis florea RQNKLLSEQMEQAQQVP...SAHIE DITKEEGGQIKIAPHESATS AILHAIVSLAMLVAYYHLK
Apis mellifera RQNKLLSEQMEQAQQVP...SAHIE DITKEEGGQIKIAPHESATS AILHAIVSLAMLVAYYHLK
Bombus terrestris RQNRLLSEQVEQAQQAAP..SAQIE DITKEEGGQIKIAPHESATS AILHAIVSLAMLVAYYHLK
Bombus impatiens RQNRLLSEQVEQAQQAAP..SAQIE DITKEEGGQIKIAPHESATS AILHAIVSLAMLVAYYHLK
Megachile rotundata RQSKLLSEQVEQAQQAAP..SAHME DITKEEGGQIKIAPHESATS AVLHSIVSLAMLVAYYHLK
Nasonia vitripennis RQNRLFHDQVEQHAQPS....AHIE DITKEEG.QIKLAPHESIAS AIMHSIISLAMLVAYYHLK
Harpegnathos saltator RQNRLLAEQVEQAQQTAP..SAHLE DITKEEGGQIKLAPHESTTS AALHSIVSLAMLVAYYHLK
Drosophila melanogaster RQYRLMREAEIAAQMQVQTQAAHMD DINKEENGMYKVVVHESPAN ACLHSLVSLAMLIAYYHLK
Aedes aegypti RQHRLLMEAEHQAQP....SGAHMD DISKEENGQYRVQPHESPAL ALMHSLVSLCMLIAYYHLK
Anopheles gambiae RQHRLMTEVDHSAP.....AHFD DISKEENGQYRMAPHESPAL AILHSLVSLCMLIAYYHLK
Anopheles darlingi RQHRLMTEVDHTAP.....AHLD DISKEENGQYRMQPHESPAL AMLHSLVSLAMLIAYYHLK
Musca domestica RQYRLMREAQEIAQQQTS...AHMD DINKEENGQYKVTVHESSGG ALMHSLVSLAMLIAYYHLK
Ceratitis capitata RQYRLQREAQDLALQQQQ.AAANVD EINKEDNGQYKVTVRESPGG AFLHSLVSLAMLIAYYHLK
Laodelphax striatella RQHRLLVEADQTTP.....AHIE TETKDDSGQAKPTDGNAALA AMLHSLVSLAMLIAYYHLK
Nilaparvata lugens RQHRLLVEADQTTP.....AHIE TEAKDDSGQAKSGDGGATLA AMLHSLVSLAMLIAYYHLK
Bemisi tabaci RQHRLLAEADKTTP.....AHIE EGSKEDGAHIKPSGHEDTPM AFLHSLVSLAMLIAYYHLK
Tribolium castaneum RQHRLKAEAESNISP.....AHIE DITKEDNGQYKMAAHESPTT AILHSVVSLAMLIAYYNLK
Dendroctonus ponderosae RQHRLKVEADQSVTAN....PAHIE EVSKEEAGQFKTPGHESSAT AMLHSIASLAMLIAYYHLK
Myzus persicae RQHRLLSQSEH.ATP.....AHIE NNMRKNSG.....SLDSKHL ALLHSLASLAMLIAYYHLK
Acyrthosiphon pisum RQHRLLSQSEH.ATP.....AHIE NNMRKNSG.....SPDSKHL ALLHSLASLAMLIAYYHLK
Pediculus humanus corporis RQRRLLTESEH.PTP.....AHIE ..HKDDNN.....KSDNLSS AMLHSLVSLAMLIAYYHLK
Lepidoptera
Hymenoptera
Diptera
Homoptera
Coleoptera
Hemiptera
Anoplura

Fig. S1 Sequence alignment of PxRyR segments containing three novel mutations.

The Genbank accession number of RyR: *Plutella xylostella*, AER25354; *Ostrinia furnacalis,* AGH68757; *Helicoverpa armigera* , AHB33498; *Heliothis virescens*, (US patent: US7655395B2); *Pieris rapae*, AGI62938; *Spodoptera exigua*, AFC36359; *Bombyx mori*, XP_004924916; *Chilo suppressalis*, AIA23856; *Cnaphalocrocis medinalis*, AFI80904; *Danaus plexippus*, EHJ73734; *Apis florea*, XP_003696991; *Apis mellifera*, XP_006569108; *Bombus terrestris*, XP_003393894; *Bombus impatiens*, XP_003484552; *Megachile rotundata*, XP_003701507; *Nasonia vitripennis*, XP_003425568; *Harpegnathos saltator*, EFN78897 ; *Drosophila melanogaster*, NP476991; *Aedes aegypti*, XP_001657320; *Anopheles gambiae*, XP_318561; *Anopheles darlingi*, ETN61080; *Musca domestica*, XP_005177526; *Ceratitis capitata*, XP_004527515; *Laodelphax striatella*, AIA23858; *Nilaparvata lugens*, AIA23857; *Bemisia tabaci*, AFK84957; *Tribolium castaneum*, XP_008191330; *Dendroctonus ponderosae*, ENN70900; *Myzus persicae*, DD408492; *Acyrthosiphon pisum*, XP_003246190; *Pediculus humanus corporis*, XP_002424547.