

Appendix A Primers used for dsRNA synthesis and qRT-PCR

Gene	Purpose	Primer sequences (5'-3')
<i>LdSPR</i>	dsRNA synthesis	F: taatacgactcactatagggCGTTCTCTCCCGTCGTCATATG R: taatacgactcactatagggCATGGCCCTAAATAGGAGTACG
<i>GFP</i>	dsRNA synthesis	F: taatacgactcactatagggAGAAGAACTTTTCACTGG R: taatacgactcactatagggTGAACGGATCCATCTTC
<i>LdSPR</i>	qRT-PCR	F: CCACTTTGATGCTAATAGTTGTGG R: CTTGAAAGTTTCCCTAAATTGCCTCG
<i>actin</i>	qRT-PCR	F: AGAAGCACTTGCGGTGGACAAT R: ACCTGTACGCCAACACTGTCAT
<i>EF1α</i>	qRT-PCR	F: TTTGCCTTCCTTGCGCTCAACA R: TGTAAGCAGCTGATCGTGGGT
<i>TUB</i>	qRT-PCR	F: AATGCAAGAAAGCCTTGCGCCT R: ATGAAGGAGGTCGACGAGCAAA

10 20 30 40 50 60 70 80 90 100

T.ni 1MAASIKKVVYFGGRNRTKLWDTLDTFD.....RSENNHYNDGTYGYPTYSR-FSA-EDFCSNHSHHLYNMTVF 71
D.melanogaster 1MNYTVLVLYCYRLAPASPEMELADFRCHVYSGFHPFTNESOLEIP.....DYGWESLDYENYQQVGGPCRMEDNHSR..... 83
N.vespilloides 1 MNRFTNNRLKGGGGHLYGCGEGTNTASAAVVAANASNFETISATS.....LAVNNTIFGNYVCSHNSHSLY 73
F.candida 1MELFDCDDEHNVLGLESSESSPSTFCOGECPACQ.....RHSLLLEGNEHSHHLYNMTVF 84
P.pyralis 1MAGITDINGEYALP-----TAYTTPNATYGSEKATSALE.....RSTSCSEKATRAEENFTEL 98
A.pisum 1MSEENYIT-----AVVFTYLTGLFFQFGTY-----EGG-----METGGGTLNMTVF 43
H.halyis 1MHCMEERYLIEG-----NHTIYNE-----SLLENTIERNHSLYLNMTVF 41
M.sacchari 1MSEENYIT-----AVVFTYLTGLFFQFGTY-----EGG-----METGGGTLNMTVF 44
B.germanica 1MAGNCTINMMGKSGCQ-----EFGGLNMTVF 26
S.maidis 1MNVHMEENYIT-----AVVFTYLTGLFFQFGTY-----EGG-----METGGGTLNMTVF 47
S.flava 1MELENYTSTRAAGVVVFVYAYFQYNGSAAE.....DGGALSHRKTGAEGFLNMTVF 53
M.persicae 1MEENYIT-----AVVFTYLTGLFFQFGTY-----EGG-----METN-----VLNMTVF 39
M.azzulite 1MAGSKIKVVYFGGRNRTKLWDTLDTFD.....ISRVNHYNDGTYGYPTYSR-FSAACIFCTSHSHHLYNMTVF 73
M.sexta 1MAD-----DYPGEYNSMLSEDD-----APRENCTCCNIT-YPSYSN-FTS-EDYCSNHSHHLYNMTVF 60
V.tanaeana 1MARPENKTEVTFPE-UNYSHTEKFGILITFFR-EILVFRVLYSFENKATSLKEYSN-FTS-EDYCSNHSHHLYNMTVF 77
P.machaon 1MADIKELLDVIAPVSCNLTHTIINGIKIM-QVIPS-HYNYSLYNETGFLKEYSN-FTT-EDYCSNHSHHLYNMTVF 77
S.litura 1MAAMEKVVYFGGRNRTKLWDTLDTFD.....ISELN-YTENDGTGYPGYSN-FSS-EDFLSNHSHHLYNMTVF 70
S.armigera 1MAGSKIKVVYFGGRNRTKLWDTLDTFD.....ISRVNHYNDGTYGYPTYSR-FSAACIFCTSHSHHLYNMTVF 73
C.suppressalis 1MAREKENTDTCFCEFNRTVDFEFP-----NFSFIINLG--EEYIN-FTS-EDFCSSNHSHHLYNMTVF 62
M.mori 1MAYTINSTNCFKCK-----PNYSINENIT-YNYTN-FTS-EDFCSSNHSHHLYNMTVF 55
A.transitella 1MAGQD---DQWAGVYFENRTHVKEE-EDRIN-----NYTYNCTIIPEYSN-FTT-EDYCSNHSHHLYNMTVF 67
D.plexippus 1MERDQWYVFCYHNSOPTARTSNTYV-----AGKINTSFINTEVTEVTPKNTN-EDYCSNHSHHLYNMTVF 73
T.castaneus 1MGENAS-----RSILIFSNCTIAMETVNVT-----VEK-----VGVLSHSHHLYNMTVF 40
Z.nevadensis 1MAGNCTINMMGKSGCQ-----EFGGLNMTVF 25
C.lectularius 1MEVEGLKILLTDYFYSIGYRA-----SLNITYRETIVTEIPLNMTVF 44
L.hesperus 1MVEPEFYPIIT-ESDSMIGANE-----TWNSIIL-LEGEERILNMTVF 43
D.citri 1MHNHALVVMHNEKVTENTITTEELNASIFPS-----NHTGLACDHMOGFFPFLNMTVF 52
G.atropunctata 1MAMVELVESALITTEENLITELV-----MLTLPTEFNHSHHLYNMTVF 46
B.tabaci 1MSAITGFTSMAYEYRIMENK-----RSGWANNQ---ETLYILNMTVF 42
L.dispar 1MAGIKRVYVYFGGRNRTKLWDTLDTFD.....IYINYFVFNCTGYGYSN-FSS-EDFCSSNHSHHLYNMTVF 69
P.xuthus 1MADEREIDVIYASASCNLTHTIINGIKIM-INDIN-QVIP---RNYSLMDNDTGFLKEYSN-FTT-EDYCSNHSHHLYNMTVF 75
P.xylostella 1MNETRIGDYPLANTPVVHFKSGLEGALINDELYSRANVSLNENCSYGGFFYSNFRVDEYCSNHSHHLYNMTVF 80

TM I

TM II

TM III

110 120 130 140 150 160 170 180 190

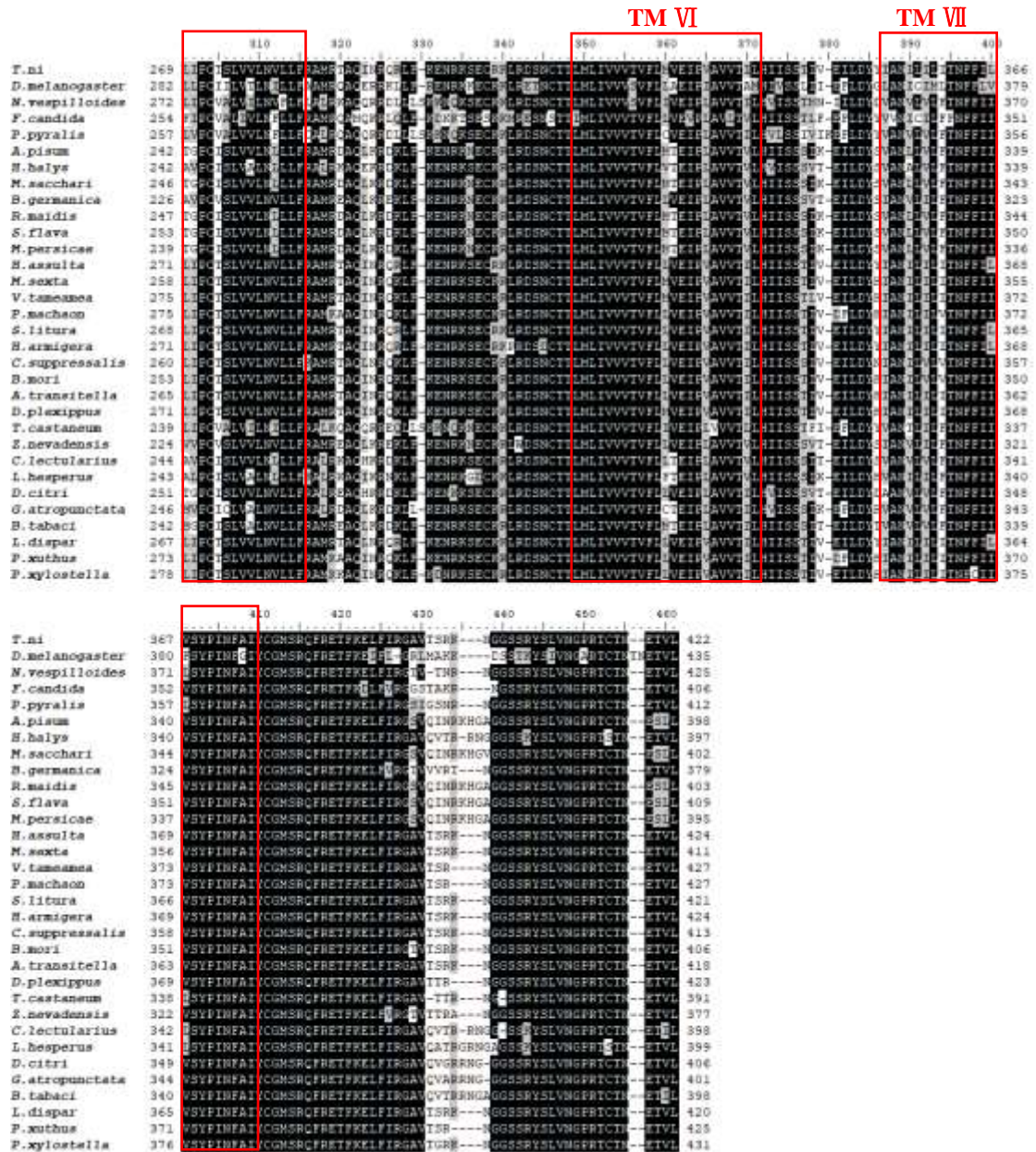
T.ni 72 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 170
D.melanogaster 84 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 182
N.vespilloides 74 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 172
F.candida 57 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 155
P.pyralis 58 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 157
A.pisum 43 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 141
H.halyis 42 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 141
M.sacchari 47 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 145
B.germanica 28 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 126
S.maidis 48 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 146
R.flava 54 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 153
M.persicae 40 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 138
M.azzulite 74 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 172
M.sexta 61 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 159
V.tanaeana 78 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 176
P.machaon 78 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 176
S.litura 71 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 169
S.armigera 74 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 172
C.suppressalis 43 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 161
M.mori 56 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 154
A.transitella 48 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 166
D.plexippus 74 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 172
T.castaneus 41 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 139
Z.nevadensis 26 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 124
C.lectularius 45 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 143
L.hesperus 44 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 142
D.citri 53 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 151
G.atropunctata 47 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 145
B.tabaci 40 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 141
L.dispar 73 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 168
P.xuthus 76 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 174
P.xylostella 81 SEYVAGVNGVDEFLIDAVTAVNTLIVVLSRRHMTPTVLMALMAGNCTLEFAPFVLYNYTIGNHTYKELSEV-AGARANNHVIIFAHPTAS 179

TM IV

TM V

210 220 230 240 250 260 270 280 290 300

T.ni 171 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 268
D.melanogaster 183 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 281
N.vespilloides 173 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 271
F.candida 156 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 253
P.pyralis 158 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 256
A.pisum 142 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 241
H.halyis 142 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 241
M.sacchari 146 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 245
B.germanica 127 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 235
S.maidis 147 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 246
S.flava 153 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 252
M.persicae 139 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 238
M.azzulite 173 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 270
M.sexta 160 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 257
V.tanaeana 177 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 274
P.machaon 177 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 274
S.litura 170 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 267
S.armigera 173 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 270
C.suppressalis 162 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 259
M.mori 155 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 252
A.transitella 167 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 264
D.plexippus 173 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 270
T.castaneus 140 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 258
Z.nevadensis 125 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 223
C.lectularius 144 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 243
L.hesperus 143 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 242
D.citri 152 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 250
G.atropunctata 146 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 245
B.tabaci 142 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 241
L.dispar 169 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 266
P.xuthus 175 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 272
P.xylostella 180 IMTLLALVCRVYVCFAPVARTWCTMRRVRSGLINDEIYVNGSGSLRHRFHRVSGVITVWSR-HFEEDVCRERMHVS-RESIDVYITGICFRPFEV 277



Appendix B Multiple sequence alignment of sex peptide receptor proteins from 32 insects. *Trichoplusia ni*, XP_026743588.1; *Drosophila melanogaster*, NP_001284892.1; *Nicotophorus vespilloides*, XP_017786519.1; *Folsomia candida*, XP_021945159.1; *Photinus pyralis*, XP_031356552.1; *Acyrthosiphon pisum*, XP_001944453.1; *Halyomorpha halys*, XP_024218766.1; *Melanaphis sacchari*, XP_025192325.1; *Blattella germanica*, PSN56754.1; *Rhopalosiphum maidis*, XP_026821801.1; *Siphia flava*, XP_025405812.1; *Myzus persicae*, XP_022183215.1; *Helicoverpa assulta*, AFH53182.1; *Manduca sexta*, XP_030037201.1; *Vanessa tameamea*, XP_026483981.1; *Papilio machaon*, XP_014367912.1; *Spodoptera litura*, AGE92037.1; *Helicoverpa armigera*, ADK79103.2; *Chilo suppressalis*, ALM88340.1; *Bombyx mori*, NP_001108346.1; *Amyelois transiella*, XP_013199292.1; *Papilio xuthus*, XP_013181400.1; *Papilio xylostella*, XP_011562912.1; *Danaus plexippus*, EHJ75336.1; *Tribolium castaneum*, NP_001106940.1; *Zootermopsis nevadensis*, KDR24017.1; *Cimex lectularius*, XP_014250084.1; *Lygus hesperus*, AEK80439.1; *Graphocephala atropunctata*, JAT21985.1; *Diaphorina citri*, XP_008469485.1; *Bemisia tabaci*, XP_018916635.1, *Lymantria dispar*.

Appendix C The survival rate of the 3rd instar *L. dispar* larvae microinjected with dsRNA

Treatment	No. of larvae	Survival rate (%)
Non-injection	120	100 a
ddH ₂ O	120	95.83±1.44 a
ds <i>GFP</i>	120	97.50±2.50 a
ds <i>LdSPR</i>	120	87.50±5.00 b

Data are the mean±SD. The same lowercase letters in the column indicate no significant differences among the different treatments using Student Newman-Keuls multiple comparisons test ($P<0.05$).