

*R. iracundus*-Hm -----MERNKNIKRLIY  
*P. plagipennis*-Hm -----MERNKNIKRLLY  
*H. halys* -Hm -----MEWRIGLSRLFC  
*C. lectularius*-Hm -----MKRSISISRVFC  
*F. occidentalis*-T -----QMWSPPGGPRALL  
*H. saltator*-Hy MGEQMLFPIDPTASLHLHFDLLTSALVSQREKVPTEVERKAIERLGLTIADEVSTGRTTW  
*A. cerana*-Hy -----MVSTSRTTC

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*R. iracundus* -LLLLCTLI-AIALSDSS-NTTTRRLRRP-----SGSSRVRDQETSASVNRFKV-RNR--  
*P. plagipennis* -LVLLCTLI-AIALTDSS-NTTTRRLRRP-----SGSSRVRDQETSASVNRFKV-RNR--  
*H. halys* -LLLLCVLL-TETYSESSTNTVRRRLRRP-----SGASRVRDQETSASVNRFKV-RNR--  
*C. lectularius* -LLLLCALI-SQTYTESS-TPTRRLRRP-----SGSSRVRDQETSASVNRFKV-RNR--  
*F. occidentalis* -LAALALVL-LAQLTDSA-TGVRRRLRRPTNNHKTSSSPSADQEPSASVNRFKV-RSRLN  
*H. saltator* RLLLVLCLVLLLGLLQHT-EGARKRFRRPPT---SAPSISSDQEVASVNRFKVTRNR--  
*A. cerana* WLLLVLCLIV-LLGALRDA-EGTRKRFRRPAT---AAPSISSDQEVASVNRFKVTRNR--  
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*R. iracundus* -----VSQNSTPVISRKSSNDASSSSS--S--NEGLKVVCYYTNWSQYRLKVGK  
*P. plagipennis* -----VSQNSTPVISRKSSNEASSSSS--T--NEGYKVVCYYTNWSQYRQKVGK  
*H. halys* -----ISQNSTPIISRKSSNDGSSSSSKDS--KDGKVVVCYYTNWSQYRPKIGK  
*C. lectularius* -----ISDKSTAVLTRKSGTDTASTSSSSSKNDDGYKVVCYYTNWSQYRPKIGK  
*F. occidentalis* AAAAGAAGAGAVATGAVVAASRKSSSTVSNVAPDSS----GYKVVCYYTNWSQYRPKVGK  
*H. saltator* -----VSNKS-----SKNELQPGKT--S----DYKLVCYYTNWSQYRTKIGK  
*A. cerana* -----ISNKS-----KKNEIQTDKS--E----DYKLVCYYTNWSQYRTKIGK  
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*R. iracundus* FLPEDIDPDLCTHIIFAFGWLKKGKLSFETNDETKDGKVGLYDRINNKKANPKLKTLL  
*P. plagipennis* FLPEDIDPDLCTHIIFAFGWLKKGKLSFETNDETKDGKVGLYDRINNKKANPKLKTLL  
*H. halys* FLPEDIDPDLCTHIIFAFGWLKKGKLSFESNDETKDGKIGLYEKIRNLKKANPKLKTLL  
*C. lectularius* FLPEDIDPNLCTHIIFAFGWLKKGKLSFESNDETKDGKVGLYERIRNLKKANPKLKTLL  
*F. occidentalis* FTPEDIGADLCTHVIFAFGWLKKGKLSFESNDETKDGKVGLYERIMTLKKANPKLVLL  
*H. saltator* FLPEDIQPDLCETHVIFAFGWLKKNKLTFSFNDETKDGKTGLYERVNLKKANPSVKVLL  
*A. cerana* FMPEDIQPDLCETHIVFAFGWLKKNKLTFSFNDETKDGKIGLYERVNLKKANPSLVLL  
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*R. iracundus* AIGGWSFGTQKFKDMSATRYSRQTFIYSAIPFLRQRNF**DGLD**VDWEYPKGGDDKKNFVLL  
*P. plagipennis* AIGGWSFGTQKFKDMSATRYSRQTFIYSAIPFLRQRHF**DGLD**VDWEYPKGGDDKKNFVLL  
*H. halys* AIGGWSFGTQKFKDMSATRYSRQTFIYSAIPFLRGRSF**DGLD**VDWEYPKGGDDKKNFVLL  
*C. lectularius* AIGGWSFGTQKFKDMSSRYARQTFIYSAVPFLRTRHF**DGLD**MDWEYPKGGEDKKNFVLL  
*F. occidentalis* AIGGWSFGTQKFKDMSKSRARQTFIYSAIPFLRARNF**DGLD**MDWEYPKGTDDKKNFVLL  
*H. saltator* AIGGWSFGTQKFKDVSSTRYARQTFIYSAIPYLRDRNF**DGLD**IDWEYPKGGDDKKNYVLL  
*A. cerana* AIGGWSFGTQKFKDVSATRYARQTFIYSAISYLRDRNF**DGLD**IDWEYPKGGDDKKNYVLL  
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*R. iracundus* LKELREAFEAEAQEVKKPRLLLSAAVPVGPDPNVRSGYDVPVAVAGYLDIFINLMAYDFHGKW  
*P. plagipennis* LKELREAFEAEAQEVKKQRLLLSAAVPVGPDPNVRSGYDVPVAVAGYLDIFINLMAYDFHGKW  
*H. halys* LKELREAFEAEAQEVKKPRLLLSAAVPVGPDPNVRGGYDVPVAVAGYLDIFINLMAYDFHGKW  
*C. lectularius* LKELREAFEAEAQEVKKPRLLLSAAVPVGPDPNVRGGYDVPVAVAGYLDIFINLMAYDFHGKW  
*F. occidentalis* LKELREAFEAEAQEVKKARLLSAAVPVGPDPNVKGGYDVPVAVASYLDIFINLMAYDFHGKW  
*H. saltator* LKELREAFEAEAQERKKPRLLLSAAVPVGPDPNVKSGYDVPVAVASYLDIFINLMAYDFHGKW  
*A. cerana* LKELREAFEAEAQEKMPRLLLSAAVPVGPDPNVKSGYDVPVAVASYLDIFINLMAYDFHGKW  
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*R. iracundus* ERETGHNAPLYAPSSDSEWRKQLSVSAAAEMWTRLGAPKEKLIIGMPTYGRTFTLTSIQK  
*P. plagipennis* ERETGHNAPLFAPSSDSEWRKQLSVSAAAEMWTRLGAPKEKLIIGMPTYGRTFTLTSLQK

<i>H.halys</i>	ERETGHNAPLFAPSSDSEWRKQLSVSAAAELWTRLGAPKEKLIIGMPYGRFTFTISTPKN
<i>C.lectularius</i>	ERETGHNAPLYAPSSDSEWRKQLSVSAAADMWTRLGAPKEKLIIGMPYGRFTFTLSSMQR
<i>F.occidentalis</i>	ERETGHNAPLYAPSSDSEWRKQLSVDYAANLWVRLGAPKDKLVIGMPYGRSFTLSNTKQ
<i>H.saltator</i>	ERETGHNAPLYASSLDSEWQKQLSVDNAATMWVKLGAPKEKLIIGMPYGRSFTLSNPAN
<i>A.cerana</i>	ERETGHNAPLYASSLDSEWQKQLSVDNAASMWVRLGAPKEKLIIGMPYGRSFTLSNLSN *****:*. * ****:*****. ** :*.:*****:*.:*****:*.:. .
<i>R.iracundus</i>	QTVNSPASGGGKAGEYTKEGGFLAYYEVCEMLRNGASYIWDDEMKVPIAIQGDQWVGFD
<i>P.plagipennis</i>	LVNSPASGGGKAGEYTKEGGFLAYYEVCEMLRSGAAYVWDDMKVPIAIQGDQWVGFD
<i>H.halys</i>	-TVNSPASGGGKAGEYTKAGFLAYYEICEMLRNGAAYIWDDEMKVPCIQGDQWVGFD
<i>C.lectularius</i>	TSVNSPASGGGKAGEYTKAGYLAYYEVCELLRNGASYIWDEEMKVPIAIQGDQWVGFD
<i>F.occidentalis</i>	YKVNSPASGGGKAGEFTKEAGFLAYYEVCEMLKTGASYVWDDMKVPIAVQGDQWVGFD
<i>H.saltator</i>	FRVHAPANGGGKAGEYTKESGFLAYYICEMLRNGAAYVWDDMKVPIVYNDQWVGFD
<i>A.cerana</i>	FRVHAPASGGGKAGEYTKESGFLAYYICEMLRNGAAYIWDDEMKVPIVMQNDQWVGFD *:*. *****:*. *. :*****:*.:*. ***** : .***:****
<i>R.iracundus</i>	EKSIRYKMKWLKESGFGGAMVWTVDMDDFNGTVCGNGVKYPLIGAIREELRGIKRGPNQ
<i>P.plagipennis</i>	EKSIRYKMKWLKENSFGGAMVWTVDMDDFNGTVCGNNVKYPLIGAIREELRGIKRGPNQ
<i>H.halys</i>	EKSIRYKMKWLKENGYYGGAMVWTVDMDDFTGTVCNGNDVKYPLIGAIREELRGIKRGPNQ
<i>C.lectularius</i>	EKSIRHKSNIWIKENGYYGGAMVWTVDMDDFTGTVCNGNGVKYPLIGAIREELRGIKRGPNQ
<i>F.occidentalis</i>	ERSIRHKGWIKDNGFAGAMVWTVDMDDFTGTVCNGGNGVKYPLIGAIREELRGIKRGPNQ
<i>H.saltator</i>	EKSTRNKMRLKSKGYGGAMVWTVDMDDFNGTVCGNVRYPLIGAMREELRGISRGSSAK
<i>A.cerana</i>	EKSIRLKMRLKSKGYGGAMVWTVDMDDFNGTVCGNVRYPLIGAMREELRGISRGSSAK *: * * *:*. . . . :*****:*****.*****. *:*****:***** *:*. . . *
<i>R.iracundus</i>	DVDWTKVASSSSVAQVTKPVAIKIPVSDVLSRLNK--VKPTVSNAIPIQDLNKREAQVF
<i>P.plagipennis</i>	DVDWTKVANSISV-EIAKPVAIKIPVSDVLSRLNK--VKPTVSNAIPIQDLNKREAQVF
<i>H.halys</i>	DVDWEKVASSSKIVQPVKPAIKIPVTELLSKLNK--AKPTVSNAILPIQDANTREAQVF
<i>C.lectularius</i>	DVDWTKVAKAPPPTA-VKPAAIKIPASDAISKLTR--AKPTVSNNIPTQDANVREAQVF
<i>F.occidentalis</i>	DVDWSKVANTIVEEK-PLPSAVAI PVSEVIAKVRKPTKQATATATLTVVDPNVRAQVF
<i>H.saltator</i>	DIDWSAVATTITETIVKKEPEYKVSSEVLSKSKK--LQK-STQLVINT-PIQEREQTI
<i>A.cerana</i>	DVDWSAVATTVSETILKKEPEYKILVSDVINKAKK--HQKQTTQLVINL-PTNERPAQSM *:** **.: * . : .:: : : : : : : : : * . *
<i>R.iracundus</i>	CYLTSWSAKRPGGGRFSPSDLQPTLCTHVIYAFATLSDHKLAAAPGTE-EQYHKIVSLRE
<i>P.plagipennis</i>	CYLTSWSAKRPGGGRFSPSDLQPTLCTHVIYAFATLSDHKLAAAPGTE-EQYHKIVSLRE
<i>H.halys</i>	CYLTSWSAKRPGAGRFAPSDLQSNLCTHVIYAFATLTDHKLAAATGTE-DQYHKVVSRLD
<i>C.lectularius</i>	CYLTSWSAKRPGAGRFQPNLQPNLCTHIIYAFATLTDHKLAAASGTE-EQYHKIIALRE
<i>F.occidentalis</i>	CYMTSWSQKRPGSGKFTPENIDASLCTHVIYAFATLKEHKLAMAEKADAMYERVVALRE
<i>H.saltator</i>	CYLTNWSHKRPGMGRFPEDIDPTLCTHVYAFATLKEHLLTEGSDKDAEMYHRLIALRD
<i>A.cerana</i>	CYMTNWSHKRPGTGKFLPEDIDPTLCTHIVYSFATLKNYLLAEENEKDGEMYERLMTLRN **:*.* ** * ** * :*. . . . :*****:*****:*. : * :*****:***
<i>R.iracundus</i>	KNPNLKILLAIGGWAFGSTPFKELTSNVFRMNQFVYEAIEFLREFQFNGLDVDWEYPRGI
<i>P.plagipennis</i>	KNPNLKILLAIGGWAFGSTPFKELTNVFRMNQFVYEAIEFLREFQFNGLDVDWEYPRGI
<i>H.halys</i>	NNPNLKILLAIGGWAFGSTPFKELTSNVYRMNQFVYEAIEFLREYKFNGLDVDWEYPRGV
<i>C.lectularius</i>	QNPNLKILLAIGGWAFGSTPFKELTNVYRMNQFVYEAIEFLREFKFNGLDVDWEYPRGV
<i>F.occidentalis</i>	KNPNLQILLAIGGWAFGSTPFKELTSNVFRMNQFVYEAIEFLREYKFNGLDVDWEYPRGA
<i>H.saltator</i>	KNPDIKILLAIGGWAFGSTPFKELTSNTFRMNQFVYEAIDFLREYKFNGLDVDWEYPRGA
<i>A.cerana</i>	KNPDLKILLAIGGWAFGSTPFRELTSNTFRMNQFVYEAIEFLREYKFNGLDVDWEYPRGG :***:*****:*****:***. *. :*****:*****:***:*. :*****:*****

*R. iracundus* DDRASYVSLRELRTAFEGEAKSSGQPRLLLLTAAVPASFEAIAAGYDVPEIAKYLDFINV  
*P. plagipennis* DDRASYVSLRELRTAFEGEAKTSGQPRLLLLTAAVPASFEAIAAGYDVPEIAKYLDFINV  
*H. halys* DDRASYVSLRELRTAFEGEAKTSGQPRLLLLTAAVPASFEAIAAGYDVPEIAKYLDFINV  
*C. lectularius* DDRASYVNLLRELMAFEGEAKSSGQPRLLLLTAAVPASFEAIAAGYDVPEIAKYLDFINV  
*F. occidentalis* DDRAAYVNLLRELMAFEGEAKSANLPRLLLSAAVPASFEAIAAGYDVPEISKYLDFINV  
*H. saltator* DDSAYVNLLKELRLAFEGEAKSSGQPKLILSAAVPASFEAIAAGYDVPEISKYLDFINV  
*A. cerana* DDRAAYVNLLKELRLAFEGEANSSGQPKLILSAAVPASFEAIAAGYDVPEISKYLDFINV  
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*R. iracundus* MTYDFHGQWERQVGHNSPLYPLESATSYQKKLTVDYSAREWVKQGAPKEKLMIGMPTYGR  
*P. plagipennis* MTYDFHGQWERQVGHNSPLYPLESATSYQKKLTVDYSAREWIKQGAPKEKLMIGMPTYGR  
*H. halys* MTYDFHGQWERQVGHNSPLYPLESATSYQKKLTVDYSAREWVKQGAPKEKLMIGMPTYGR  
*C. lectularius* MTYDFHGQWERQVGHNSPLYPLESATSYQKKLTVDYSAREWVKQGAPKEKLMIGMPTYGR  
*F. occidentalis* MTYDFHGQWERQVGHNSPLFPLESATSYQKKLTVDFSAREWVKQGAPKEKLMIGMPTYGR  
*H. saltator* MAYDFHGQWERQVGHNSPLYPLESATSYQKKLTVDYSAREWVKQGAPKEKLMIGMPTYGR  
*A. cerana* MTYDFHGQWERQVGHNSPLFPLESATSYQKKLTVDYSAREWVKQGAPKEKLMIGMPTYGR  
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*R. iracundus* SFTLVDETKFDIGAPASGGGKPGNYTAESGF MAYYEICDFLHEDNTTLVWDNEQQVPFAY  
*P. plagipennis* SFTLIDEAKFDIGAPASGGGKPGNYTAESGF MAYYEICDFLHEDNTTLVWDNEQQVPFAY  
*H. halys* SFTLVDEEKFDIGAPASGGGKSGNYTAESGF MAYYEVCDFLHEDNTTLVWDNEQQVPFAY  
*C. lectularius* SFTLVDEDKFDIGAPASGGGKPGNYTAESGF MAYYEVCDFLHEDNTTLVWDNEQQVPFAY  
*F. occidentalis* SFTLVDP TKFDIGAPASGGGTPGKYTG EAGFMSY YEVCDFLHGDNTTLVWDNEQQVPFAY  
*H. saltator* SFTLV DKEKFDIGAPASGGGVAGNFTNESGFLSY YEVCSFLNEDNTTLVWDSEQQVPFAY  
*A. cerana* SFTLV DKEKFDIGAPASGGGTSGNFTNESGFLSY YEIC SFLNEDNTTLVWDSEQQVPFAY  
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*R. iracundus* RGDQWVGFD DERSLKT KMGWLKEEGFGGIMIWSIDMDDFRGVCNGKFPLVNAMKQELED  
*P. plagipennis* RGDQWVGFD DERSLKT KMGWLKEEGFGGIMIWSIDMDDFRGVCNGKFPLVNAMKQELED  
*H. halys* RGNQWVGFD DERSLKT KMGWLKEEGFGGIMIWSIDMDDFRGVCNGKFPLVNAMKAELED  
*C. lectularius* RGNQWVGFD DERSLKT KMTWLKEEGFGGIMIWSIDMDDFRGICNNGKFPLVNAMKQELED  
*F. occidentalis* RDDQWVGFD DERSLKT KMTWLKDEGFGGIMIWSIDMDDFRGSCGTGKYPLMTAMRQELDG  
*H. saltator* RDDQWVGFD DERSLINKMSWLKEEGFGGIMIWSIDMDDFRGSCGSGRYPLIKAMKELQG  
*A. cerana* RDDQWVGFD DERSLINKMQLKEEGFGGIMIWSIDMDDFKGTGAGKYPLIKAMMKELRD  
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*R. iracundus* YTISLEYQGPYEGTSTGGAYTTKDPNAVTC EEEEDGHISYHPDKADCTMYMCEGERKHHM  
*P. plagipennis* YSIKLEYQGPYEGTGTGGAYTTKDPNAVTC EEEEDGHISYHPDKADCTMYMCEGERKHHM  
*H. halys* YTIKLEYQGPYEGPSSSGAYTTKDPNAVTC EEEEDGHISYHPDKADCTMYMCEGERKHHM  
*C. lectularius* YSVKLEYQGPYEGTGSSGAYTTKDPNAVTC EEEEDGHISYHPDKADCTMYMCEGERKHHM  
*F. occidentalis* YKVKLEYDGPFE GTSTSGAYTTKDPNVTC EEEEDGHISYHPDKADCTRYMCEGERKHHM  
*H. saltator* YKVKLEYDGPYESTSRNGKYTTKDPNEVMCDEEDNHISYHADKNDCTMYMCEGERKHHM  
*A. cerana* YKVKLEYDGPYESH LRNGRYTTKDPNEVSCDEEDNHISYHPDKSDCTMYMCEGERKHHM  
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*R. iracundus* PCPSNLVFNPNENVC DWPENVEGCTQHTQAPPASRR-  
*P. plagipennis* PCPSNLVFNPNENVC DWPENVEGCTQHTQAPPASRR-  
*H. halys* PCPSNLVFNPNENVC DWPENVEGCTQHTQAPPPSR--  
*C. lectularius* PCPSNLVFNPNENVC DWPENVESCSQHTQAPPAARR-  
*F. occidentalis* PCPANLVFNPNENVC DWPENVEGCMHHTQAPPTSRRR  
*H. saltator* PCPVNLVFNPNENVC DWPENVEGC LQHTQAPPV----  
*A. cerana* PCPVNLVFNPNENVC DWPENVEGC LQHTQAPPV----  
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**Supplementary Data 3:** Alignment of Chitinases from order Hemiptera (Hm) (e.g. assassin bugs, bed bugs, stink bugs), Thysanoptera (T) (e.g. thrips) and order Hymenoptera (Hy) (e.g. ant and bee). Active regions were found using Interproscan website using *R. iracundus* protein sequence and highlighted in yellow. Asterisk (\*) shows conserved amino acid residues. In bold are generally conserved residues from the active site motif known for the activity of glycosyl hydrolase family 18 (GH18).