

Supplementary Table 1 Subcellular localization of proteins predicted using CELLO (Yu et al, 2014), targetP v1.1 (Emanuelsson et al., 2000), ProtComp 9.0 and Euk-mPLOC 2.0 (Chou and Chen, 2010)

Gene Name	CELLO	targetP v1.1	ProtComp 9.0	Euk-mPLOC 2.0
ABCB1	PlasmaMembrane	other *	Plasma membrane	Cell membrane
ABCC1	PlasmaMembrane	other *	Plasma membrane	Cell membrane
ABCG2	PlasmaMembrane	other *	Plasma membrane	Cell membrane

* mean the proteins are non-chloroplast, non-mitochondrial and non-secretory protein.

1 10 20 30 40 50 60
 P.lima MAMSAATPVEVDNMELEEIAGEADMEKAETDDERRQRQKEENEKLLKTEYNGPPLRKLKLSRME
 TetraselmisMAKGNADHEKVPK.....AVGYHKLYRYATPTD
 F.solarisMAVKDTSVETSSQGESKGRKSPPPQ.....ASVSETLRFVFCGLST
 S.microadriaticum MASNQAD...DADDEMVAEAKVETEVEVOTKKNIP.....AASLCKLEFSMDFVVE
 70 80 90 100 110 120
 P.lima ILIFAVGCLAAVAHGLSDPLICFLDGLDIDATAGDAG.....LSAFDNNVSKVVRFCWV
 Tetraselmis GLLIALGTLGGIAHGATLPLWALLFGDVIINTFGAVGS.....DFMEKVRRSISLAFMYL
 F.solaris QLLFVAGCAIAGVANGMVPALAYLFSSSFSDISAASN.....DGLAQRVRELAFTFMIV
 S.microadriaticum VVLLVGCGLGALGNGLSPLLCIVFGDLIDGMGEATGGAESFTPFOMLGAMDGMSSQMEELCITMMLV
 130 140 150 160 170 180 190
 P.lima GVGIVVAGTIGQEFVCFYFTDVEASKIRFLYFKALLYRDVGVWFDTHDVGAALPTEIEELETYKDGIGP
 Tetraselmis AVGSFVVSYLQMGWMLVGSQAARARIRFLLSALNODHSFYDSTASTGALLNRMEDCVTIETAMGE
 F.solaris GTYALVASSLQGWCFEICAYRGCNFRKWFKALLRODAAYFDVHDVAATANAVGPASNKFRRGICR
 S.microadriaticum GVGATFAAFVLOGACEKIFAEKQAFKRYLYDFDVLHQDSSWFDTKVVALPAELINDLEKIQDAFGD
 200 210 220 230 240 250
 P.lima KLGSSITMAVSTLFFGYAFALYLSWQVALVMTAVLPCMATGAAIMSGAAKDIQOERQAYGRATLIDE
 Tetraselmis KAGTFVFNVSFFSGIGIALAYGWDLLVLVLAAMPLVGGSMALLFKVMGDSRRKSAAYSEANSIAQS
 F.solaris KFGEGIQFLOCTGIFGLAYAFYSSWRVALVLCVIPFVCAAMAVMTFNQKGTSAEAYSRAVSAYT
 S.microadriaticum KFGNGMMAISAFMGGFCGAFGMGWLILVLMCSILPFMVGAAFGKAVQETONESWAYRASAVVEE
 260 270 280 290 300 310 320
 P.lima VLFVAVRTVVSFGGEGHRELRGRYRAGVEEARRGIRARAAMGVGLCYIQCVFVLSYALAFWFGMLVY..
 Tetraselmis ALSAVRTVYSFN.....AEAAATQAAERMVGRQSAAVGLCLCAFQLFMFCAYALALWYAAGRIR..
 F.solaris TVSSIRTVLSLNAIPSFIRQVEATSQAQRMSTSMFLKTLGLANGSMGSLCLYAILSLYGTALFYRD
 S.microadriaticum CLNAMRTVVAFGGEGHRELRKFSAAALVETRRGVKNGFKVYAGMYTMMIIFLGYGLAFWFGMLRYNE
 330 340 350 360 370 380 390 400
 P.limaGGA DLSAGK LQAFFCVILAGLT VGNIPFG LAALAA ARGSMARFFYLEHQG.
 TetraselmisSGEYDGGTVMTVFFSALIGGFSIGQANPCIVAFQNGRIAGARLFAVIDRAP.
 F.solaris IDDTGCDPSAGVAGAVSCDSTGPEVFGSMLGVFAAQVVSQFNGFSEAFQARVAVYEALQTNRLP.
 S.microadriaticum ELNP.....ATGKLWEPGTILMAIFFCIFI GSFMI GNLDPSLKA MKAQAQTAA GFFRALENKPE.
 410 420 430 440 450 460 470
 P.limaETQKHLADEGEPCAPTETLELRDVEEFA
 TetraselmisSIDLHKGG.RTIEAVAGEVSLRQVEEFA
 F.solaris APEKIFKPKDDALSMTTRSASNKSSEVEQVLKAILPKYQIDSTATTGFKPESLAGSINVKDVEEEN
 S.microadriaticumDIQCRVEDKRQDISSTIEKEFEENVHEET
 480 490 500 510 520 530
 P.lima YFAREQCKVLDGVSFLLTKKGVAVVGGSGSGKSTVMALHEREYDPAACVVLVNDVLRQLSITASYRA
 Tetraselmis YPSRPEAKVLDGVSLTARAGQVALVGGSGSGKSTIISLWERYVDPLAGSVLDGVP LCELDLKWLRSA
 F.solaris YPTRRQDPI LNMNVEIAAGQTVAFVGGSGSGKSTIVSLHEREYDPLSGVIELDGKDLKEYNVTHLR
 S.microadriaticum YFAREQCKVLDGVSLTARAGQVALVGGSGSGKSTVMALHEREYDPAACVVLVNDVLRQLSITASYRA
 540 550 560 570 580 590 600
 P.lima HVGTVGQEPVLFATSVKDNIMOGCPSATMKDVERVAREANLDFTDRLPQKFNFTVGS GGSOFGSGGQK
 Tetraselmis QIGVVSQEPALFATTIYENIAYGRPGATEAEVRRAAQANADSFLELPSGGETTVGEGGVOISGGQK
 F.solaris MIGVVSQEPVLFATTIRGNIRYGNPDAEDQVEEAARMANAHDFSAFTDGYDTVGGDKGSGSGLSGGQK
 S.microadriaticum CHGVVQEPVLFASSIRHNIMOGNPSAKEDVVKACNDALIGFDVNDLPEKYNFTVGS GGSOFGSGGQK
 610 620 630 640 650 660 670 680 690 700
 P.lima QRITARALLKAPSVLFLDEATSALDNTSERMTQDITDSTGASSELGMTIIVIAHRLSTVKNADVITFV
 Tetraselmis QRVAIARAVLKDPKVLLLDEATSALDAESERLVQGALERLMAG...RTITIVIAHRLTTRIRGAQHIQV
 F.solaris QRITARAVLVGNPRHLLDEATSALDAESLVVQDALSILQKKK..ITITIIIAHRLSTIRNADKIIVV
 S.microadriaticum QRITARALLKAPSVLFLDEATSALDNTSEKMTQATIDSTISANTADGLGIVSIAHRLSTVRSNDSLIVV
 710 720 730 740 750 760 770 780 790 800
 P.lima MKEG...KVAEQGTHAELAAAPGGIYRFAFAAQALS.....IEEPREEA
 Tetraselmis MQQG...KLVEGSHAELLAKPHGAYALIAVQEAASGSRETQMPSAIQGDALVPSFPVDDAAQAE
 F.solaris IQGCKVKPKLLI LDEATSALDNESEAIVQAAIDKLMERSQSTVIVIAHRLSTIRNADTIAYIDGAKVYL
 S.microadriaticum MSRG...TLVEHGNHASLMEKKG..IYALVAAOES.....HKADEDEEK
 810 820 830 840 850 860 870 880
 P.lima VELERQATGPIQEAQATVSKKSTQRSTCSTIEEEREQOQREKETSASQYKVP.....MARL
 Tetraselmis RAVEAQAKPPAEKPAAGSGRETRSWLRCLSAKAKQVPSADEEMALDADKPREPDAGGQAGPKLGRLL
 F.solaris EQGSHDELISRPHGLYKRLFDSSRMKSNLTLNGSKADGDTSTEVEEEINWSEIEKEQASAFDARA
 S.microadriaticum DAAATSNDHTAQNVVRSSTNSGSESTQTRVCKREKD.AEANREKETSASQYKVP.....MARL
 890 900 910 920 930 940 950
 P.lima LGFCRPEWAFVPGIVGAVISGAYPLMAVYALVEATLAFVLYTAPSDRE.....
 Tetraselmis MALNAREWHLMVLGVI GSAGICATMPAFVALSSIIVVFFS...PDLD.....
 F.solaris RRLASPDAFFIMGSGAVLAGGVFPANGVIFSETIDLFRVREVC PDANGDVIDGFGSCQDYWKSVA
 S.microadriaticum LSYNREWPPFFLPAIIGAVVDSAMPVCTIALVGSMSGEFK...PDKE.....
 960 970 980 990
 P.lima LLREEVEKACTL FVIFAAK FVGTALQYVSFAILGESITKRCRVAML TATFRQETGFHD DPEHTPAR
 Tetraselmis EQKQKADMWCLIFVAVGLSVFVCSLEQFSFGVMGARLATRVRVMLFGAMLRQEVGWRDRDENNSGA
 F.solaris DEIQDGSFKVSVYWLCLLIGCLIGNIVVFWFGHASERLSKRVRDSAFATAI IRQDVAFDK..RSIGR
 S.microadriaticum EMRADLELWALFRVTVIGSAFVIGTSVSHGCFSELGEMTORLRVAILTGMFRQEVGWRDHPANTPGM
 1000 1010 1020 1030 1040 1050
 P.lima LLOGTQVNAFRIS.TLCITFGDKADATASIGVGVVLAFTAQWOMALIMLASIPFIYALSTAFQLIVEGG
 Tetraselmis LTIMTGTDAAHIRGAVGDTFGIIAQNLF TLGAGFVIAFLNDWRMTLVIIA AVPLIVVAGIQA KLLQE
 F.solaris VTSELDQDAARIQAFCEPIRQLIVALS SVLTCVTVISLVFMWQFALLAICVPPMGFATS IEMKTFILG
 S.microadriaticum LSKATLWALFRVTVIGSAFVIGTSVSHGCFSELGEMTORLRVAILTGMFRQEVGWRDHPANTPGM
 1060 1070 1080 1090 1100
 P.lima S...KVEESRALKQATQVVSDSL TGVRSVHAAGNERDVLKLFSTLVQRDQGNLAKLQCGIGYGSF
 Tetraselmis SP...ESVTTKEAANADQVAEEAFQNIIRIVQAFNLQEGVTSLWEKYSAADARGKSRRAHVTVGLGFS
 F.solaris EDIGNVNADELNSPGGIVVETLLNIRVVSALCLENARYENYKQALLNAEPNHRDFAFMGCTMAGLSM
 S.microadriaticum A...SKNENITNANQIVVDSVMNARTVQALGVEKGLVGMYSVWEKSLVGMWRNII LACLGFGISN


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1      10
P.lima      .MMEFESPCARAAAP.....
C.merolae  MDTQFGQNGEGAADREGVQETAARHGADASASRSAQPEWFPYSGQPAESVHEAQSPVPDDEFAEQLDI
F.solaris  .MTSYGSIQGNMSP.....
S.microadriaticum .MMAEAAENDRFTNYYVYDDELFNDRKRNRLGLDGMKVCLALLDADQGSGETISP.....DRFKA

...
P.lima      ...LRLRGE...VQRVPLDLDVGNAA...PG
C.merolae  AVAETAEQNDLTLGRERMSLVRHEVLSTPLAAEEDPNVDGVPRTAVQEAQADGIGIDPASQEKHPK
F.solaris  SNTDPHETTPLVNGR...SDSNIIEHVST...
S.microadriaticum .AYCPVKAEEKWLTKMKKTYGKNAECPMFERSGSESGAPQQAAPAAV...PG

40
P.lima      SAAAAAE...AATSPMPF...T
C.merolae  HAADALESQSTSAIATAGSAYFYQYQGRQAGVTDYHRYAQDQMRRIAEAAALATGDSASRKPLPELE
F.solaris  .OTETA...
S.microadriaticum .OTETA...EVLHQITLLGNDKNHKKTAAS

50      60      70      80      90      100
P.lima      GGLVSRLLFFFTWTFQLLKQAADTKLLEPSDFLALPAGSEPPQLYDSFTEAWRR...AAAAVAR
C.merolae  ASWLSRW..TFWFGSLIWRG...WRRLLDDSDLYELAPDDRAQPLSERFAVAWVDFLERQEERITR
F.solaris  GGYSKLLTFHWFTPLVLRGNEKLLDQDDLLALVPLLNDCTDYVTTTFDKYWEELQKECPSSLVN
S.microadriaticum .IGAWTDADEAFQTLILAARHDLDMIKYAHTPQSEFELPAGRKVFLLTATCNHKAAGLSPTEESFAV

110     120     130     140     150
P.lima      GPPFGA.GAGTHA...ASVLKTLWRV.LIAKLLVWVWGRGAQTLLKF...
C.merolae  ELERER.QARTAKTGALDGVAPRKDDSLDHVDEEQRLRQRSRWPMFWVILRVHTRIIIVSGILKFF
F.solaris  ALVRSF.GA...EYLEGAALKL...VHDLCLF...
S.microadriaticum .QLRHGRISHGAFALRNAGGQNGRAKLGYLMAVERNEPAAGGLVA...VKKLRLRVAGFEGIT

160     170     180     190     200
P.lima      ...AFPYCLNSLVNYYNDEREP.LWSGLRPALLLFIQVVALTLVTNHMDCWTTVIGLRTSRM..L
C.merolae  DVGLGQVSPVFLNKLLIWLTEPGAPTYQGYLWVLAIFLAPFLKAFVENQYFYTLFRLAVRIRGE..V
F.solaris  ...VGPQVLSHMIVFLRDPDAPLLWGLWIFAVTISQLAMSICLRHYFYKCYTTRLRTRTA..I
S.microadriaticum .RVC...TGESCLHRRVADSEKRRARR...VRVFGHCLRGF..DFYLWSDRPEKLNSTEDKN

220     230     240     250
P.lima      ISAVFHKVCRLRLDTLAEFSSGRLLNIIIT...TVDVAVRTLPLNHLQVLLT
C.merolae  QSAYVDKSLRLLSASARAQTTTGEVWNHMQ...LDAQRLSDFMQYAH.VLWA
F.solaris  VMAYVRKALLLSPEERQSRSMGEITNLAS...IDAQRLLQDITTYLN.AVWS
S.microadriaticum .IGAGISRPOVLRPTAVSGKSGMKAEMLQGRGLGVREWLNVAGGVACNONPLOLQAMFLSNVLLATWI

260     270     280     290     300     310     320
P.lima      MPTLTIATALFSLYKTLGIAGLIGVFWMSVVIILLNPLLVRLSRKLSARQAKTDERVRRVGETIAAT
C.merolae  ALLQGGALALLIVYLGYSGLIG.FLAAVLTVPLOGLYLVKRLSGFRRLTFGITDRVRKLLNEMFQGI
F.solaris  SPLOIGLALFFLWRQLGPSLGG.VS.VIIIMIPVTKYIATWMGTMQANLMKAKDERVELNAEVLGGM
S.microadriaticum .REAGQGPAFDDQSSYL.LASLAFALCAFRVSAAMYETKISRHLHOKMLASVLRQPLNWDYDTPPLG

330     340     350     360     370     380
P.lima      QIIRCAYEWEAAAEKVRQARQELQYH..WVLKVVYGSMAIWSQSTVPIATMFTFASYTWLNPPDR
C.merolae  KTLKIFYAWEPPFAVKVTEIREQELAAAYRRTVFVTRILEYVW..LFV.TPVLVSAVTFGFYGGVFH.NQ
F.solaris  KVIKFQAEESFQKRIQTEREALQLLR.YFLGTSESRM..LWVFTPLLVALATFSAY..VWSGHK
S.microadriaticum .RVLNRF.S.QDISLMDLQMPRLREFAMQ..HFAVVFVGLIGASVLAWPALLVLLLIG...WPLRR

390     400     410     420     430
P.lima      LTAATAFTAMSLGLLQAPTFMIFGVTQIVGASISGKRIG...QLLQLE...
C.merolae  LNPAFIFAGLSVLNLLRFPLIQYFVFTALVDARIGVORLQ...RFFALEEIEPSPATER
F.solaris  LDVASALTALSLFDLLRFPLMPLQINSIIEAAVSIDRLR...GFFISE...
S.microadriaticum .LQDRYVGSVALNLQRLM...LMAITSPVMSQVSGFLLAMDTIRAFRRERHFVVKRFFETMD...

P.lima      LSTDAKSSSSSSDLMGDPAQLKLDKQKRTPSAEDAQVPPAPHQPESTRSRWRFWRKPVRAAKHSA
C.merolae  .....
F.solaris  .....
S.microadriaticum .....GYYKTYWIHAVDRDLAMGLQ

440     450
P.lima      PSSEHPTDAIDGADASGSVMTRAREPSGAIPAEASSLPALHWGSPANLPAVAGVSGLSEQ..VEL
C.merolae  VG.....ININGVSAVYGSKNT...
F.solaris  IA.....VCVPFITLCLGASVM...LL
S.microadriaticum .....

460     470     480     490
P.lima      EPPREMGPPSSGSGLSID...FEAASFTWSLGRSGAEA...
C.merolae  MDSTDTAENGQGTGMLLD...KPSKDLSSGLGRASSSF...RKEPMYVIEIEHGCFDWTLSKEQP
F.solaris  .EGGTSRAGRKDTLEKD...KEVAILRALLSDAEQEI...QK...LQGEQP
S.microadriaticum .VYAGSLSPFELGLGLALTVGLAQRIPLYLWCWSTFEKFFGGAQRVAEYASLAWEGDKQDHDYWKQGL

500     510     520
P.lima      .AATDFEAGGQAEATADFM.....ADLTLKVRREGLLIV
C.merolae  APASASASATEGQQLPKRRLALFQRLWHRRELRRQPPQPEVRLKPVFEVPALEDVNLRIPPRALVAV
F.solaris  FSRQEPVIDQAGSSLCRR.....VNFKINQGEVIAI
S.microadriaticum .PVKSQGRAGGASPVALELREVFRLYQPLPLT...LQGLSLAVRPPGERVGI

530     540     550     560     570     580
P.lima      VGATASCKSLIHAVLGEPMQTSNLRGHAYVSRIQP...MGFVPOQPWIFNGTVRQNV.LFG
C.merolae  VGRVSGKSSLVSAIILGELQRRSGTVRVHG...S...VAYSAAAWIYNGTVRDNIL.LFG
F.solaris  VGSVSGKSSLINSILGELRLLTGKTEVKG...T...LAYFSQTPFIMNASVRDNI.LFG
S.microadriaticum .CGRTSGKSLFLACFRMVEAEGGEIHVVQSAKSLPLPELRASMAIVPODPLMFSSGIRSNLDLHG

590     600     610     620     630     640
P.lima      ...EPYDEQRYLECVRSCALQDFALLQAGDQTVVGEKGIALS GGQKARVSTARATYRAPSCGILLI
C.merolae  ...LPEYFKRYRRAIYVSAALNADLEILPAGDLTEICEKGINLSSGGQKQVSTARLVYA..NADVNIL
F.solaris  HVNPPDEDLYQRALDCCALRHDLSLLPDGDQTEICERGITLSSGGQKARVALARAVYH..RADITLV
S.microadriaticum ...QYSDAELLAALRLAHLLEEVHGMPPQKLDPEVQERGSNFSAGTVQLICARLLLA..KQRIVFL

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650 660 670 680 690 700

P.lima DD PY SAL DAHV ARE V HD . TAV C KL LRRR TR VVVTNRLE FLK . . GC DQ VLVLDA GRVE
C.merolae DD PL SAL DAHV GDHV FQ . . KIL SNEH GV LRKR TR VLVTNHL QYAS . . RCDW IWLME NGRIA
F.solaris DD AL SAV DAHV AKHL FD . . RAI LDELMOPTIP G S MR . . SVVLVTNAL QYLNHP RINK IYVIE GRIV
S.microadriaticum DE CT ASVD LKTD AQV QSAI RSA C GDC . . AI LCI AHR LDT I I . . DY D LRAVLDS GRVI

P.lima ASGS YAE VCRSS RT . LTD LLAAGLQ PGSD VED DSDPQSP E
C.merolae GQ TL QH LITSS PR . FVE MLAAM TA TR STQSKTQV GDNTEPAED DLHR LDAD DADGHR ERSESTKE
F.solaris EEG YSS LSNNP DSV FAR ILSVI KDNK VSK DLSET E D SSTEPK KTL
S.microadriaticum ETGS PSEL LQQQ GA . FTG LVASMGDAGAE IRRKLAASPPAPAPT EGCAMGRKAKRGTPD DLEPVPA

P.lima SAPGSADVGDSSKDVASEQSPMSAEQAETRA SCNV E
C.merolae RTSFFSSSGVSGDP SVTGR ETQKSTDRGQLVVTET EINK . CHVA
F.solaris TSTP SDNGHN LSTKKT KPSKLVSELRKTKIS
S.microadriaticum VPASAEA SAATA EPD S TLGSL LSTERRRP RWD DTPRL LCTGIVAGYLP GQPG EEDLEQAQPOLCPDR

P.lima RDV VLY YVRHL G . GVFAV ALVAAVS LSE LFS LSLP
C.merolae LS VYG YAKRC G . NP YLF IAILS F VSGEAVVNN
F.solaris TEAY LNS WIHAS G . GF MIA FFILVLF A AGEVGF LSN
S.microadriaticum QSQEV RDTPELQD SPISKLQRRYI NVAASVKG P GHYTMNPEK MOPCAKY SDRSRCD ICGKGERLFE .

P.lima I WLSK W I SNPVRDEEAF YLGT YVLSV C C V S M A A R D M V S M C V S L R A A A K L H A N M I T A V . . L R A P M T
C.merolae W W L S F W S E H E Q Q Y T L G F F L G I Y F A L A G H A I I S F F R T Y W F L L L T I V A A R Y L H A E L L D S V . . L R A P M A
F.solaris W W L T Y W S R H A D E A S Q F S F L S T Y A I I N L S A A L A G V F R M L F V A L V S L K A S R H L F D G L L N A V . . L F A P M S
S.microadriaticum I F R A W E R S S O F A P H L R K L H R V I A Y F G K D C G R G L L G K R T S V I D L E R A K E L L E S S E S L R E Q I S S L N

P.lima FFQD TPQGRITNRF SKDINE IDVSLIFKV VYTLVPLNTVGNFAVVLVSAYFS AICFAPAALIYWRV
C.merolae FYDV TPVGRILVRF SRDIMQIDFQLPQQYISFLQQIASIIAAYVFI AVIFPIFVAAMPITVLYFVL
F.solaris FFD TPVGRILVRF SKDVI IDQLVQLTIRMLQTVFSILSTFVVISGVTPTFLVGLVPLCLFYISE
S.microadriaticum ARDRAALHRAIVRISGQVEGTRINPELAAQAEQSFGRHLRAEDPFRALHRAIICYAISHRDLAVLVASHM

P.lima QKYI NSGCT DIK RIEK TSSSPVYNHFS SLCREN GISTV R
C.merolae QQIY NPANI QFR RLD SISKGP IYSHFSETL . NGLTTI R
F.solaris QRF TLTYREIK RLD SVLRSP IYALLGETI . DGVACI R
S.microadriaticum KRQHRWPEMGLLMKALQCL ELQEP LPSVQRMSRLELYECITVWT . AALPCLLEVELYDNGFPGAPK

P.lima AFHQVR QCAI SNGLVAEQQR PLYAETY
C.merolae AYRQA YQAVNRRFR IDINQR AYHQVT
F.solaris AFSAQK S L T D R L K V M L D E Q Q H A Y F L T C T
S.microadriaticum I F K A A S Q P V Q E E P S S K K S R G K K K T K D K K A A A P E V Y S V T L I Y L S V V G E L H V E R S P R K P L A A K P L L E A A

P.lima VAAW LAMRLDLLGFTLLLVSA LVFARG HL
C.merolae GNRW LALRLEVLGLLVFITGIFGVTSK NT
F.solaris AQS LARLELIGLTVITFATS AVVEHALFGA DE
S.microadriaticum L P G W S S G A E V V V V V V V V V V V V A V A A A V V V V V V V M A V V Q V S G E D V L S A L Q O T W P D C T S R R N V

P.lima ISTGSA ALAL KMAN DTSSMAGLVROLS . QFSGMGN CVERIKEIYVTE
C.merolae TYVGLT GLALTYAL QVTSALSLAVRSIT . EVEQLMNSVERNFYITDS
F.solaris TFAGLA GLAISYAL SVTQSLNWSVRMAS . DLANMVAVERVOEYSQI
S.microadriaticum LQEGQTSVQAFCLGLAKAYFAPEMRLSRGTOVLP SLTKL LALFA RTIPGDPDFKYSTIQLNRRNYAR

P.lima LPAEAPAVVAEHRP PPGW . PSAGLLEVRNLWLYRPGYF . . FVLQGLS FETA PGE RIGIVGRTGAG
C.merolae IPHEN . . LDGEEP PPSW . PQVGETV F E D V S L R Y R P Q L P LVLQD V T F R V A G G E R V G I L G R T G S G
F.solaris RHEELRNAELDEKLP PNW . PAHGEIVFKGAKLRYRPNLP LVLKGLDLHIPSGSKIGVVGRGTGAG
S.microadriaticum LHVDK NNNGPSW IIALGXEYTGGLWLYDPHVP KEKECVKVKVEMP LRGYPLKVLV . GQMLPG

P.lima KSSLLALFRIVE PFS GSTVLDGQDMLT MGLQDTRASLA IIPQEA IILFEGS
C.merolae KSSIIVALFRIVE IPVNETTGKPMGRILIDGLDISKLRVRSIRSLTIIPQDPVLFSGS
F.solaris KSTLMVALMRIVE LDE GSISIDGDIRQIGLGIKIRRVAVIPQDPVLFSGT
S.microadriaticum RAHSIQNRWLRFDGRC PHAALRFEGRMSLVYFSR . RGSSTILPEARQVLEGLHMLPLPTEA

P.lima . LRANCDPFSLYSDAEVWSALESAQISSVWNEQVAVQSREGGARLSHS P L D L M L R
C.merolae . IRLNLDPFGLYTD AELWSALRYAHLDD AVHAMP GG LEA QVA
F.solaris . IRSNLDPFDFSEDLHTVLESVGLYKRTMEG . SMHSYSSLPLARVD SIDTVV
S.microadriaticum L I A G T S D A L P H S S E T P C T S A E D A D S D D D E F P D Y S A E A N G A G I L P R D F S E V L H A L E A A P A T D Q A V

P.lima EGGQ NLSA GQRQLVAMARAILRSLKLVVLD EATASL DAA TD SAIQ QVVRRSFHGATLTIAHRLQ
C.merolae EYGENLSAGQRQLICLARALLRHPRLISDEATSSV DFQTDKVIQDVIRQQFEDATLLAIAHRLF
F.solaris EGGNYSV GQRQLV IARALLGAKIVIDEATAV DAETDAIQVRLVRFANATCLTVARHLN
S.microadriaticum IGVASLGAGIAAPMSLHPLGFKTEVITAAEDTAIRLAKGFKVAKATKDV . DSFIIKKGKGLCEVRRHKQV

P.lima TIMDS DRV LVIQ AGT IAEI GPDPVLR QKEGGC FQSVMV
C.merolae TLAAFDTC LVMH HGR VAEYGDPELLSTRPDGQFSRLVYSLGPRASAR FRALLR
F.solaris TIMDSDFI LVM DGK LAEFDKPDALV RKGGL FRDLVK
S.microadriaticum EDLKP PREHIFHAVVDGAPLP LICYNEERGE STSKDTA AFRKIEAFLAE RRPCLALIEVPD FDDVLS

P.lima EAE R Q
C.merolae EHAPQRRHRQSSRKGRALSMTATSGSALEAEPDSVHPEIDP
F.solaris AASHD
S.microadriaticum T L N R A I R A I D T C N F I R V L W S V C V E E V G E L G

Supplementary Figure 2 Alignment of ABCC1 from *P. lima* with other algae (*Cyanidioschyzon merolae* strain 10D, *Fistulifera solaris*, and *Symbiodinium microadriaticum*) ABCC1/MRP1 transporter proteins.

P. lima
Tetraselmis
F. solaris MIDDSSAPRDESESESASTATPVIADATTAEGVFDIPSCMPAEALYNCDILTPEEYNAATNTGAQLIQL
S. microadriaticum ..MNSLKFQPTLGEPCSLQLLDCERRACCSSKKLLPKFLLFPVGCALPRGRSSSCPVGVPAGLAVL

P. lima
Tetraselmis
F. solaris VSEMLRT.....VDESIRESENKGENLLSMNEGLSLSVADYQVATEVPPERP
S. microadriaticum EGPSMDTDPEDTDPDPEEYSRFGWVPPRESRVSRGATGHDLGSAAGGSGSAPCIYGAASKPERAERP

P. limaM¹AHEGPI
TetraselmisMLDEQNFTEVRRK
F. solaris IQLAVKHAPQYCGLPSELADDSQRSSSSNSAASFRGFPDKFPESIR....ETLPPEADFFAIREGM
S. microadriaticum AKCDVIQSPKIMEAAQKAGDRAVPEAACTVGARYSSAVESLCKDLEFVTGESGDVQLDPTL¹AYGAA

P. lima AMEWQNLTYRLPPKRR..GEIG.RAVLKDAPFKCDPGLM¹AILGASGSGKSSLNALAGR...MPY
Tetraselmis VISWENLTYEIPAGGSCFGERKQKT¹VLKNVSGVALPGLTAVMGPTGCGKSTLLNALAGR¹LHKVGVV
F. solaris TLAWKDVN..LTVKGR..GKILD¹RRILQNVWGEVPPKETTAIMGSSGAGKSTLMNVLSGR...TAS
S. microadriaticum ALTEFKDVSFEL¹LPGRE...RIL¹ILSPCSGHFEPGL¹LV¹ALMGPSGSGKSTLLDILAGK...KTSFY

P. lima IPKTEL¹LAGSILIQAKGGTFYANTVDLPS¹ISAYVE¹QEDALF¹ALS¹TV¹EBTL¹RMFG¹RFR...FPH¹LREAE
Tetraselmis SGEVLVNGA.....LRADDFYGY¹SAYSL¹QDDALF¹GNLTVRET¹FWVSHLR..LPAGT¹SRQQ
F. solaris GGNVQVKANITLDNVPAD..PTKIGVRO¹MIAFVA¹QDDSLQV¹TATPREA¹IRFSAKLR..LGRS¹LTDDQ
S. microadriaticum TGQVHLNGL.....PRNELFPR¹LTSYV¹QDDVME¹P¹TVT¹VK¹EQV¹MFHTALK¹TEVP¹STVRRD

P. lima LMKRVNDVICVIGL¹NPARN¹TLVGS¹DKPGQ¹RGTS¹SGGERKRV¹H¹LG¹LELL¹HK¹PR¹LIF¹VDEPT¹SGL¹DSY¹HA
Tetraselmis RQSAVEELIKMNGLSGAAD¹TYIGSSM..RRCVSGGERKRAAIA¹VELISN¹PCIL¹FIDEPT¹SGL¹DSFQA
F. solaris LDIMTQCLMHELGLVACAD¹TIVGGPL..IKGSSGGERKRTSV¹GVELV¹VK¹PMLE¹FIDEPT¹SGL¹DSFSA
S. microadriaticum WAKT¹IELQLRAVGL¹EEVQ¹N¹SLIGSDV..V¹RGTS¹SGGQRRRV¹SLACGLA¹TGA¹QIE¹FIDEPT¹SGL¹SATDA

P. lima LNVMATL¹KDLAIS.GHTVVCS¹IHQPRSS¹IYQ¹LIDK¹LILMAE¹QVAY¹FGD¹CGVAC¹AKH¹FAK¹IGYAV¹PQ
Tetraselmis QSVLEAL¹LRGLAEM.GRTVVIV¹IHQPRSS¹IFQ¹MFDR¹LCVLS¹QGRALY¹MGVAA.KSADH¹FAQ¹IGFPC¹PQ
F. solaris VQLCQL¹LK¹KVARV.GASVMFT¹IHQPRSS¹IFREED¹Q¹LILLN¹KGRVMY¹QGPVS.TIADY¹FGAR¹GHP¹PP
S. microadriaticum EQCVR¹MR¹LCKKY¹GVSTVVA¹IHQPR¹QEVAV¹LEDH¹LLLL¹TS¹G¹DV¹VY¹NG¹KMT.EARRY¹MSD¹AGE¹VPD

P. lima DFNPAD¹HFLD¹VTSVDF¹RT¹PA¹QEA..KTRQ¹TMEQV¹I¹ANCP¹PLGSEL¹M¹TPKP¹TGA...LLPPE¹L¹AGM
Tetraselmis NFNTAD¹FILDLV¹SIDS¹RTPE¹SEA..NTAER¹VEK¹LARHFEE¹QSRDK¹MNNVE¹VQVEQ¹PASQ¹PPP¹KGR¹SI
F. solaris NYNPAD¹WIMKVAQ...KVP¹I¹QEL...EEA¹GFFPK¹DERKAT¹VTNE¹VDT¹SEL¹LILRN¹QS¹IPQA
S. microadriaticum LVSP¹TDY¹F¹LDLVT¹PGT¹LDS¹QV¹DL¹REFY¹QTS¹PKK¹ASVDEL¹VDRE¹LCKAA¹LTA¹EEL¹LEARHRR¹LSQF

P. lima GRRHV.....PFGVAFG¹MLLK¹RTWREL¹TRDKAAL¹AIKYGA¹NIWF¹TIIFG¹CVY¹FQM...EKT¹TQ
Tetraselmis GTRRP.....GFFRQFG¹VLFW¹RSLR¹Q¹NARN¹HNVPN¹AIT¹LV¹QSVL¹IAVLLGLIY¹QDI...EMN¹Q
F. solaris KEKPP.....TMTTEIS¹MLVW¹RELV¹HIRRAKSVT¹VARI¹I¹Q¹TIVL¹SAVIGL¹IFD¹VGNAP¹ND¹SV
S. microadriaticum GDM¹PL¹RS¹HS¹IYGVRE¹QKQL¹KV¹F¹QVRL¹LLR¹DQ¹QG.VTE¹ILL¹AMV¹QALVY¹GAAY¹IGL...GKGE

P. lima TGLQNRSG¹ICFF¹MAMN¹QAFGS¹TIG¹VAKVI¹PQQLK¹VV¹RE¹RAAK¹LYD¹IFP¹FYM.....ATF
Tetraselmis TGIKDR¹GLVLF¹VINT¹SMSAV¹FT¹IIQ¹VFP¹AEK¹GIV¹SRE¹RDS¹Q¹TYS¹VAA¹YFA.....SKY
F. solaris SNLQGH¹FGA¹IIMVAT¹IIMM¹GP¹AQAALL¹SF¹PDER¹PV¹LRE¹YST¹KHYS¹VSS¹YFL.....SRL
S. microadriaticum DAGYHOV¹CFY¹MLVMT¹CALSG¹IKD¹VVST.REPG¹PL¹DS¹EVPA¹RWVE¹FGL¹YLL¹RECSG¹DSEGM¹SEPS¹F

P. lima ICQLP.....LELIP¹QLI.....FGAAV¹YT
Tetraselmis ISEMP.....FKIFG¹P¹IV.....NGI¹I¹LYW
F. solaris SIEAM.....MGAL¹Q¹SLL.....TTL¹ICYF
S. microadriaticum RVGLP¹GALGDEDD¹ELHEK¹DSP¹SKKARATHK¹QSGEV¹TMD¹SLR¹QLL¹WEQA¹QMLLD¹AQKSS¹TAQV¹QHA

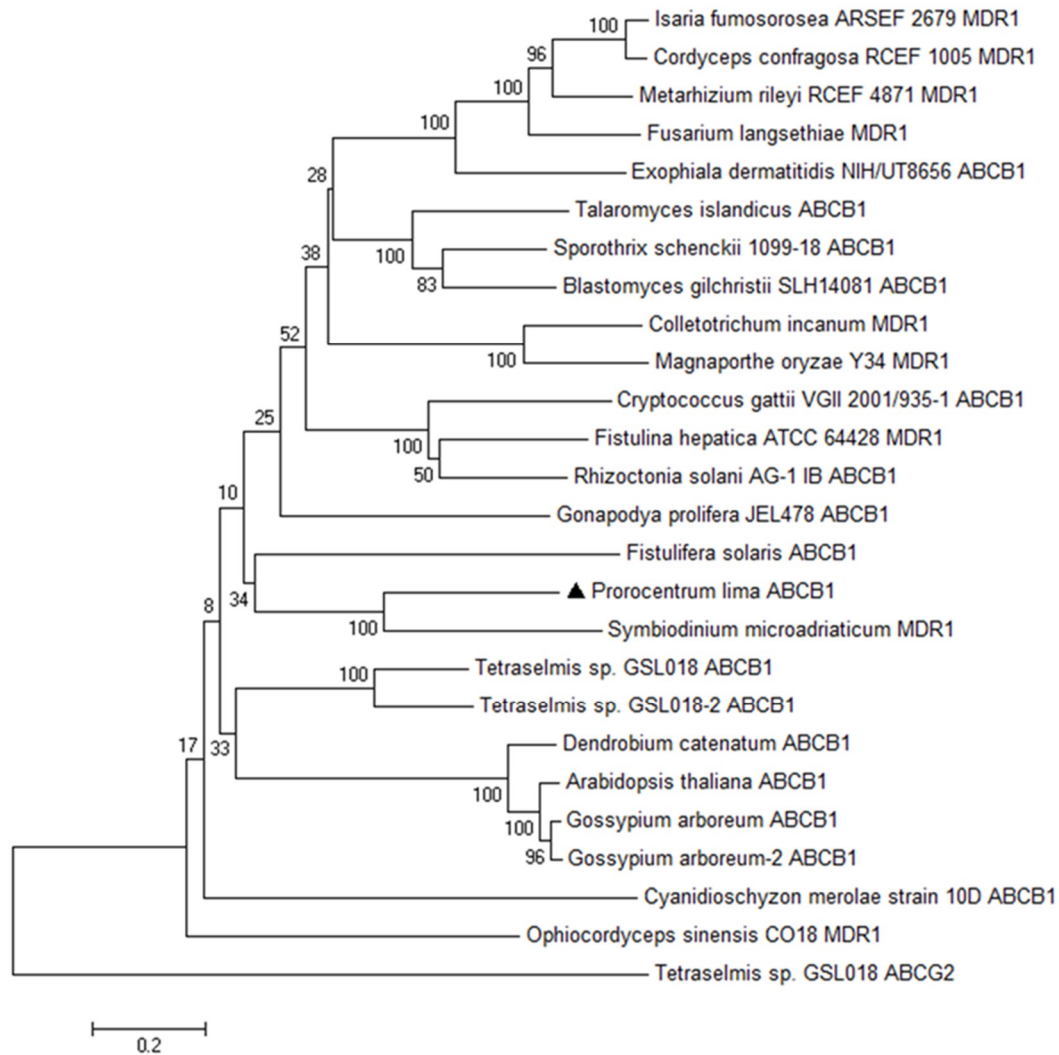
P. lima LTGLRPGIDYMTYVAVLML.....ENFAGIG¹LGMVMSA¹SF.TKVE¹QVP...
Tetraselmis AVGLNPAEAFFFL¹LLLAT.....LGLCAA¹IGLAVGAWC.PTQE¹VTF...
F. solaris AIDFR...GSFIN¹YYGACFT.....LAMGSTA¹IAVILGA¹AAGSS¹SIAT...
S. microadriaticum LQDLEK¹RQSQR¹LDAVEAK¹LQH¹HDTKT¹VGIEER¹LLD¹QDR¹LSKVE¹Q¹QSAAGR¹GPDR¹RAT¹LVFGG¹WK

P. lima .QIAPLVIVFFL..MFSGLL¹LN...QDD¹IPS¹IF¹RP¹LKH¹V¹SF¹IR.....YAFQ¹AL¹TV¹NEL¹RGN
Tetraselmis .AVAPLIMIVFM..LFGGFF¹IK...VES¹LPT¹GSEW¹VAY¹LSP¹ML.....WGFV¹GV¹TTND¹LRGL
F. solaris .AALPLVLLPQM..LFVGY¹FVS...PEL¹IP¹VW¹LRW¹IY¹IC¹PMT.....YATR¹ILL¹VAE¹FQ...
S. microadriaticum NOTRKNVLLHQ¹LNSAIT¹GLN¹LKDEF¹DS¹EPFT¹GL¹RRS¹IALCN¹FKKREG¹EGEDG¹CRTR¹MLG¹ILQA¹INT

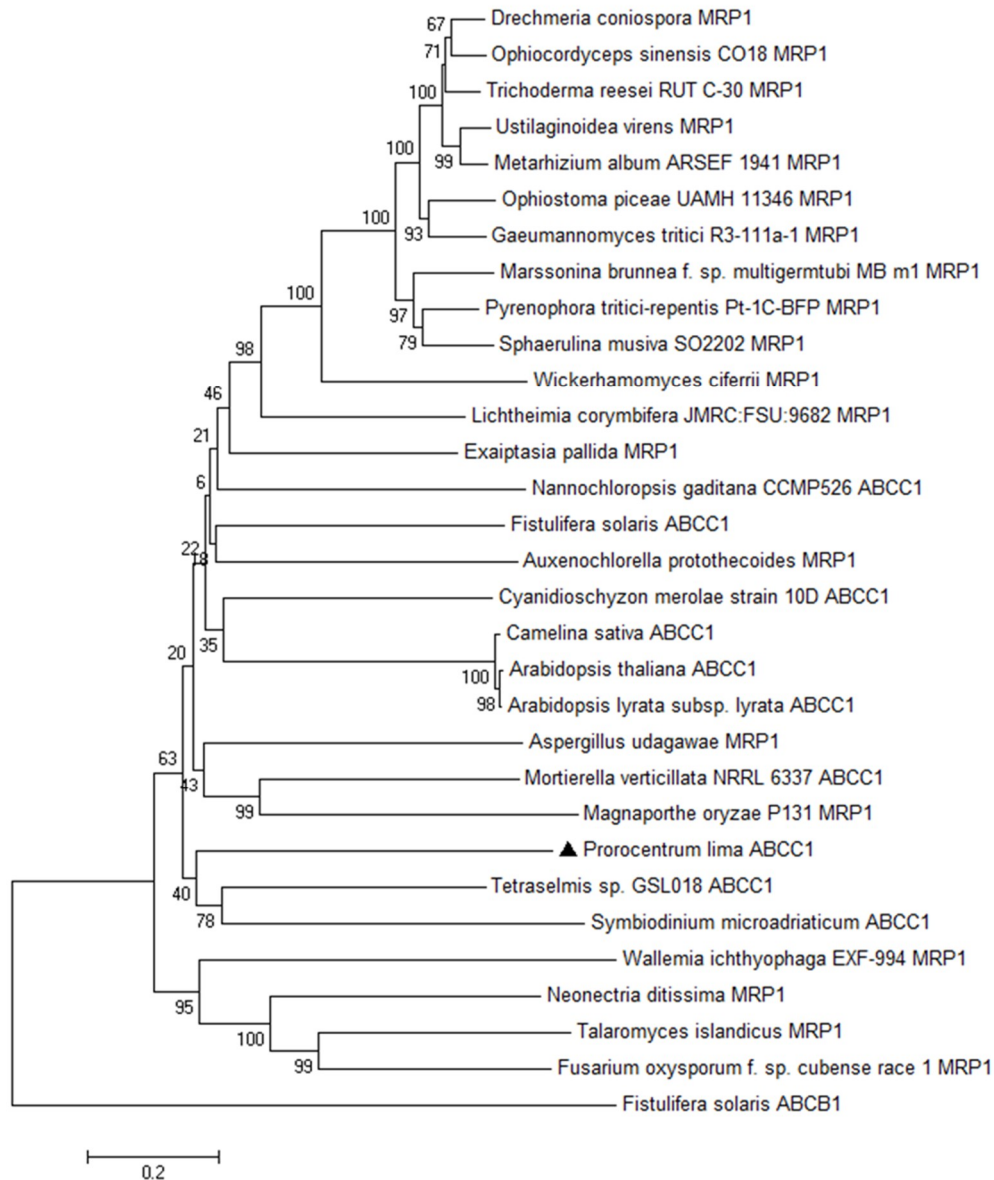
P. lima TGFE¹C.....SGTG¹LGRRC¹LQGD¹DWL.....D¹.Q¹LS¹FGEVSI¹QRSMKI¹LF¹L...
Tetraselmis DGWE¹CEPAASNTSSAPGEQ¹EDCN¹LVRECS¹TIGE¹NIL.....EKE¹LD¹FAKYTR¹WEALMY¹LV¹LVG
F. solaris ...T¹C.....EES¹FLSQ...IYQ¹SLL.....DNT¹GAD¹PDEV¹L...YWC¹ILI
S. microadriaticum AKVSM¹DGADK¹PLWCSFSRSP¹EEGR¹AALAA¹L¹VKK¹SVM¹RLCPGRGG¹D¹LEVE¹FESSGMT¹WIRED¹QLSGM¹G

P. lima .EILVFNLLAFR¹TILNGKQ¹PR¹MKA¹KANPN...AA¹SKDML¹IGA...
Tetraselmis AGV¹LVFGY¹LGLV¹VIGNRYQ¹PLSQ¹ERR¹FRP...IL¹SSRSR¹VAAGRS
F. solaris GQFV¹FR¹LIALAIL¹HKSAQR¹FY.....
S. microadriaticum TAPREVRN¹.PMEV¹LTKAGK¹G¹WIDE¹H¹TLAKWCEVD¹VA¹AIREIA¹SEHRF

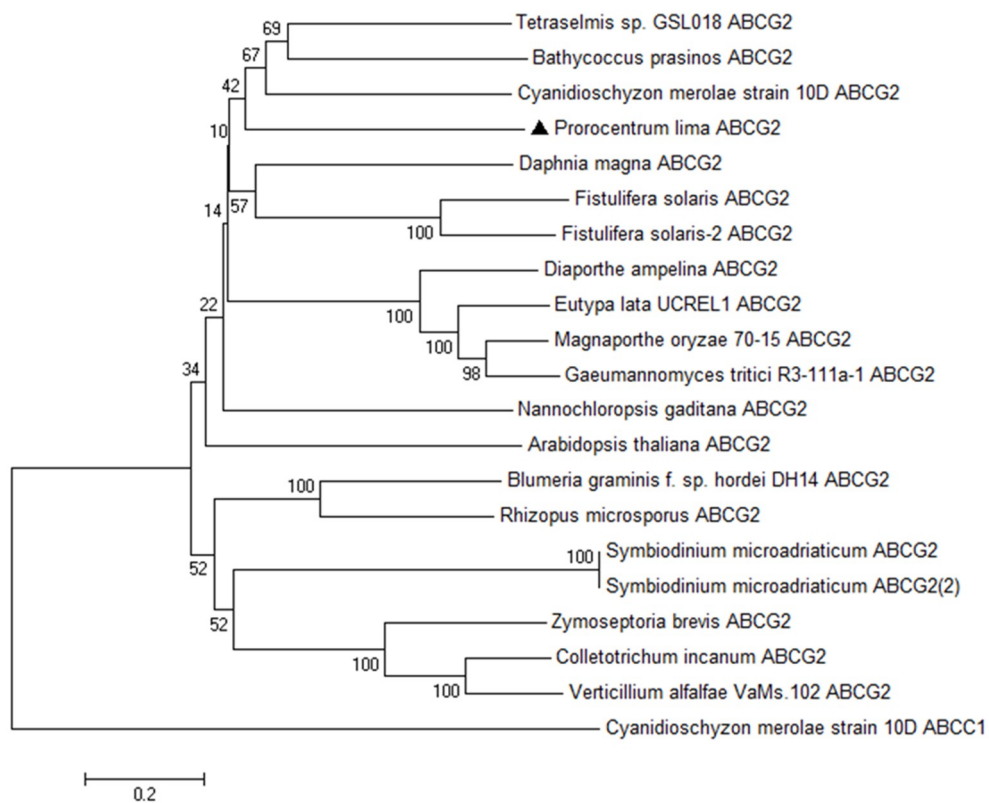
Supplementary Figure 3 Alignment of ABCG2 from *P. lima* with other algae (*Tetraselmis* sp. GSL018, *Fistulifera solaris* and *Symbiodinium microadriaticum*) ABCG2 transporter proteins.



Supplementary Figure 4 Phylogenetic tree based on multiple alignment (Clustal 3.0) of various ABCB1/MDR1 transporter amino acid sequences from various plants and algae. Tree was generated using the neighbor-joining method. Percent concordance shown at the nodes is based on 1000 bootstrap iterations. ABCB1 transporters are as follows: MDR1 (XP_018701169.1) for *Isaria fumosorosea* ARSEF 2679; MDR1 (OAA74823.1) for *Cordyceps confragosa* RCEF 1005; MDR1 (OAA35161.1) for *Metarhizium rileyi* RCEF 4871; MDR1 (KPA41886.1) for *Fusarium langsethiae*; ABCB1 (EHY53853.1) for *Exophiala dermatitidis* NIH/UT8656; MDR1 (CRG91977.1) for *Talaromyces islandicus*; MDR1 (KJR80784.1) for *Sporothrix schenckii* 1099-18; MDR1 (OAT13273.1) for *Blastomyces gilchristii* SLH14081; MDR1 (KZL80199.1) for *Colletotrichum incanum*; MDR1 (ELQ42255.1) for *Magnaporthe oryzae* Y34; ABCB1 (KIS00281.1) for *Cryptococcus gattii* VGII 2001/935-1; MDR1 (KIY44784.1) for *Fistulina hepatica* ATCC 64428; ABCB1 (CEL54430.1) for *Rhizoctonia solani* AG-1 IB; ABCB1 (KXS15947.1) for *Gonapodya prolifera* JEL478; ABCB1 (GAX29293.1) for *Fistulifera solaris*; MDR1 (OLQ15128.1) for *Symbiodinium microadriaticum*; ABCB1 (JAC83958.1) for *Tetraselmis* sp. GSL018; ABCB1 (JAC73905.1) for *Tetraselmis* sp. GSL018-2; ABCB1 (XP_020679153.1) for *Dendrobium catenatum*; ABCB1 (NP_181228.1) for *Arabidopsis thaliana*; ABCB1 (KHG30028.1) for *Gossypium arboreum*; ABCB1 (KHG25987.1) for *Gossypium arboreum* -2; ABCB1 (XP_005535498.1) for *Cyanidioschyzon merolae* strain 10D; MDR1 (EQL01639.1) for *Ophiocordyceps sinensis* CO18. ABCG2 (JAC83372.1) for *Tetraselmis* sp. GSL018.



Supplementary Figure 5 Phylogenetic tree based on multiple alignment (Clustal 3.0) of various ABCC1/MRP1 transporter amino acid sequences from various plants and algae. Tree was generated using the neighbor-joining method. Percent concordance shown at the nodes is based on 1000 bootstrap iterations. ABCC1 transporters are as follows: MRP1 (KYK61458.1) for *Drechmeria coniospora*; MRP1 (EQL01282.1) for *Ophiocordyceps sinensis* CO18; MRP1 (ETS00260.1) for *Trichoderma reesei* RUT C-30; MRP1 (KDB17864.1) for *Ustilaginoidea virens*; MRP1 (KHO00668.1) for *Metarhizium album* ARSEF 1941; MRP1 (EPE10310.1) for *Ophiostoma piceae* UAMH 11346; MRP1 (EJT81949.1) for *Gaeumannomyces tritici* R3-111a-1; MRP1 (EKD20282.1) for *Marssonina brunnea* f. sp. 'multigermtubi' MB_m1; MRP1 (EDU40488.1) for *Pyrenophora tritici-repentis* Pt-1C-BFP; MRP1 (EMF11638.1) for *Sphaerulina musiva* SO2202; MRP1 (CCH41464.1) for *Wickerhamomyces ciferrii*; MRP1 (CDH53089.1) for *Lichtheimia corymbifera* JMRC:FSU:9682; MRP1 (XP_020903336.1) for *Exaiptasia pallida*; ABCC1 (EKU20214.1) for *Nannochloropsis gaditana* CCMP526; ABCC1 (GAX21062.1) for *Fistulifera solaris*; MRP1 (KFM23846.1) for *Auxenochlorella protothecoides*; ABCC1 (XP_005537371.1) for *Cyanidioschyzon merolae* strain 10D; ABCC1 (XP_019094624.1) for *Camelina sativa*; MRP1 (NP_001031116.1) for *Arabidopsis thaliana*; ABCC1 (XP_020866423.1) for *Arabidopsis lyrata* subsp. *lyrata*; MRP1 (GAO82707.1) for *Aspergillus udagawae*; ABCC1 (KFH70890.1) for *Mortierella verticillata* NRRL 6337; MRP1 (ELQ66541.1) for *Magnaporthe oryzae* P131; ABCC1 (JAC66611.1) for *Tetraselmis* sp. GSL018; MRP1 (OLQ15328.1) for *Symbiodinium microadriaticum*; MRP1 (XP_009270082.1) for *Wallemia ichthyophaga* EXF-994 ; MRP1 (KPM36182.1) for *Neonectria ditissima*; MRP1 (CRG89601.1) for *Talaromyces islandicus*; MRP1 (ENH68971.1) for *Fusarium oxysporum* f. sp. cubense race 1. ABCB1 (GAX29293.1) for *Fistulifera solaris*.



Supplementary Figure 6 Phylogenetic tree based on multiple alignment (Clustal 3.0) of various ABCG2 transporter amino acid sequences from various plants and algae. Tree was generated using the neighbor-joining method. Percent concordance shown at the nodes is based on 1000 bootstrap iterations. ABCG2 transporters are as follows: ABCG2 (JAC83372.1) for *Tetraselmis* sp. GSL018; ABCG2 (XP_007509928.1) for *Bathycoccus prasinos*; ABCG2 (BAM82508.1) for *Cyanidioschyzon merolae* strain 10D; ABCG2 (KZS09610.1) for *Daphnia magna*; ABCG2 (GAX11407.1) for *Fistulifera solaris*; ABCG2 (GAX12580.1) for *Fistulifera solaris-2*; ABCG2 (KKY38206.1) for *Diaporthe ampelina*; ABCG2 (EMR71650.1) for *Eutypa lata* UCREL1; ABCG2 (XP_003713947.1) for *Magnaporthe oryzae* 70-15; ABCG2 (EJT81949.1) for *Gaeumannomyces tritici* R3-111a-1; ABCG2 (EWM27479.1) for *Nannochloropsis gaditana*; ABCG2 (OAP09062.1) for *Arabidopsis thaliana*; ABCG2 (CCU81831.1) for *Blumeria graminis* f. sp. hordei DH14; ABCG2 (CEG64621.1) for *Rhizopus microsporus*; ABCG2 (OLQ08707.1) for *Symbiodinium microadriaticum*; ABCG2 (OLP84914.1) for *Symbiodinium microadriaticum*; ABCG2 (KJX95289.1) for *Zymoseptoria brevis*; ABCG2 (OHW95109.1) for *Colletotrichum incanum*; ABCG2 (XP_003007046.1) for *Verticillium alfalfae* VaMs.102. ABCC1 (XP_005537371.1) for *Cyanidioschyzon merolae* strain 10D.