

ПРИЛОЖЕНИЯ

к статье А.С. Тугбаевой, А.А. Ермошина, И.С. Киселевой «Предсказание функций некоторых пероксидаз *Arabidopsis thaliana* L. на основе биоинформатического поиска»

Приложение 1

Аминокислотные последовательности референсных пероксидаз (по материалам базы данных Protein NCBI, <https://www.ncbi.nlm.nih.gov/protein/>) и пероксидаз *Arabidopsis thaliana* с высоким уровнем гомологии (на основе поиска с использованием сервиса Protein BLAST, <https://blast.ncbi.nlm.nih.gov>)

Пероксидаза, NCBI ID белка	Аминокислотная последовательность
Референсные пероксидазы	
ZePrx34.70 Q4W1I8.1	msyhkssgtilmvplfmlisvnyfmscnaqlsttfydttcptalstirtssirssvssnrnaalvirllf hdcfvqgcdaslllsgageraspandgvlgyevidaakaavervcpgvvscadilavaardasvavggps wtvrlgrrdsttsnaaqaatdlprgnmvslqslisnfankglntremvalsgshtlgqarcirfrgriynst lriepnfnrslsqacpptgndatlrpldlvtpnfsdnnnyrnlvtvrgllisdqvlfnadstdsivteyvn npatfaadfaamvkmseigvvtgtsgivrtlcgnps
ZPO-C BAD93164.1	maisispfsafililtvipfseaglsphyhqtcpqaediifqtvrnasiydpkvparllrmffhdcfir gcdasllldstpankaekdgpnnisvrsfyvieeakakiekacphtvscadvlaiaardvvamskgpwvwp lkgrkdgrvskanetlnlpspfsnattliqs fakrgldvkdltvltsgghtlgfshcssfsarihnsidpti nsefamslkkkcpkknkdrnagelfdstssrfndyykritmgkgvfgsdqalygdsrtkgivdsyakdek lffkefaasmvklgnvgviedgeirvkcnnvn
CWPO-C BAE16616.1	msqkvvlmflv amagtatvqggqtrvgfyattcrraesivravtqvshftsdsiiaapgllrmhfhdcfvng cdasilidgantektagnlllrgydviaadaktqleaecpgvvscadilalaardsvvltkgltpwvptgr rdgrvslasdtlnlpggftsdvqvqkfaafglnaqdlvtlvgghtigttaqqffryrlynfthttgngadp sinpsfvsqqltclcpqngdgsrrialdtgsqnsfdssffanlrsgqgilesdqklwtddatrtfvrflgv rglaglftgvefgrsmvkmnigvktgttgeirrvcsain
HRP CCJ34837.1	mefvrslcvfitlfgclissahgqaaarrppisgtrigfylvttcptaieivrn avragfnsdpriapgil rmhfhdcfvlgcdgsvlisgntertavpnlnlrgfevidnaktqleatcpgvvscadilalaardtvvlt rglgwqvptgrrdgrvsvasannlpgprdsavvqqkfsavglntdrldvllagghtigttagcgvfrdrf nntdnpvnqlftqltqcpqngdgvavrldtgsqgtdfnsyfinlrsrgvlesdhvltwdpatrpivq qlmsprgnfnaefarsmvnsgnigvvtgangeirrvcsavn
HRP-A2A CCJ34825.1	mavtnlsttcdglfiisllvivsslfgtssaqlnatfysgtcpnasavrstiqqafqsdtrigaslirlh fhdcfvngcdasillddsgsiqseknagnpansargfnvvdniktalentcpgvvscsdilalaseasvsl tggpswtvllgrrdsltanlagansaipsfeglsnitskfsavglntndlvalsgahtfgrarcgvfnnr lfnfsgtgnpdpptlnstllsslqqlcpqngsastitnldlstpdafdnnyfanlqsngllqsdqelfstt gsatiavvtsfasnqtlffqafaqgsminmgnispלטgngairldckkvngs
HRP-C1C P15233.1	mlhasfnaqltptfydnscpnvsnivrdiinelrdspsiaasilrlhfhdcfvngcdasilldnttsfr tekdafgnansargfpvvdriikaaveracpvtvscadvltiaaqqsvnlaggpswrvplgrrdsrqafdl ananlpapsftlpelkaafanvgnlrrpsdlvalsgghtfgknqcrfimdrlynfntglpdpptlnntlyqt lrqqcprngnqsvlvdfdlrtptvfdnkyyvnlkeqkqliqsdqelfsspnatdtiplvrsyadgtqtfn afveamnrngnitpltgtqgeirlncrvvnsnslldhdivvdfvssm
TPX1 NP_001289850.1	masfsylmsvvlvclviigytnaqlelnfyakscpkaekii kdfvqqvqpkapntaaailrmhfhdcfvrgc dgvslnftstngnqteklapnltlrgfsfidavkrlveaecpgvvscadilavardavvategpfnwv ptgrrdgtisnvseangdipaptsnftrlqqsfakkglldndlvllsgahtigvsrcssfserlyntfgvv gtqdpsldseyadnlksrkrsindnttivemdpgsfktfdlsyfklllkrgrlfgsdaaltrrtstksfi eqlvdgplneffdefaksmekmgrvevktgsageirkhcafvns
Пероксидазы <i>Arabidopsis thaliana</i>	
AtPrx4 NP_1729061	maifkilvlllslccfsqaqlsptfydqtcqnalstirssirtaisrerrmaaslirlhfhdcfvngcdas vmlvatptmeserds lanfqsargfevidqaksavesvcpvgvvscadiiavaardaseyvggppyrvkvgr dstnrafraiadrdlpnfraslndlselfrktglntdrldvalsgahtlgqaqcltfkgrlydnssdidagf sstrkrpcpvnggdttlapldqvtpnsfdnnnyrnlmqkgllesdqvlfgtgastdsivteysrnpfrfa sdfsaamikmgdiqtltgsgdqgirricsavn
AtPrx52 NP_1961531	masnkli silvvlvlllqgdnyvveaqlttnfydstcnpnllstvtavksavnsearmgasilrlffhd cfvngcdgsillddtssftgeqnaapnrnsargfnvidniksavekacpgvvscadilalaardsvvalgg pnwnvkvgrrdartasqaansnipaptsslsqllissfavgllstrdmvalsgahtigqsrctnfrariyn etninaafattrqrtcpragsgsgdgnlapldvttasfdnnnyfknlmtqrgllhsdqvlfnnggstdsivrg ysnpsffnsdftaamikmgdispltgssgeirkvcgrtn
AtPrx36 NP_1906682	mntktvksmagivlsqisvalfplcicyqthqstssvaslspqfyenscpnaqaiqvsvyanayfndprm aasilrlhfhdcfvngcdasvllldssgtmesekrsnanrdsargfevideiksalenecpetvscadllal vardsvicgppswevylgrrdareasligsmenipspestlqtiltmfnfggldtldlvallgshstigns rcigfrqrlrynhtgnndpdtlnqdyasmlqqgcpisgndqnlfnldyvtptkfdnyyknlvnfrgllss deilftqsietmemvkiyaenegaffeqfaksmvkmgnispלטgtgeirricrvnhdv
AtPrx66 NP_2000023	mafskglifamifavlaivkpsaealdahyydqscpaaekiiletvratnatlydpkvparllrmffhdcfirg cdasilldstrsnqaekdgpnnisvrsfyviedakrklekacprtvsadviaiaardvvtlsggpywsvl kgrkdgtisranetrnlppptfnvslqigsfaarglsvkdmvtlsgghtigfshcssfesrlqnfskfhdi dpsmnyafagtllkkcprt snrgknagtvl dstssvfdnvykqilsgkgvfgsdqallgdsrtkwivetf aqdqkaffrefaasmvklgnfgvketgqvrvtfrvn

Продолжение табл.

Пероксидаза, NCBI ID белка	Аминокислотная последовательность
AtPrx64 NP_1990331	mnahtmlnlllvivifvsvfdvqalsphyhdhtcpqadhivtnavkkamsndqtvpaallrmhfhdcfvrgcd gsvllsdskgknaekdgpnnislhafyvidnakkaleeqcpgivscadilslaardavalsggptwavpkp rkdgriskaietrqlpaptfnisqlrqnfgqrglsmhdvalsggthlghfahcssfnrlhkfntqkevdp tlnpsfaarlegvcpahntvknagsnmdgtvtsfdniyykmligqkslfsdesllavpstkkklvakyans neferafvksmikmssisgngevrlnrcrrvr
AtPrx47 NP_0013201241	mltrfkkqnnkmvrnivsmvllmhaivgfpfharglsmtymmscpfaeqivknsvnalqadptlaagl irmlfhdcfiegcdasilldstkdntaekdspanlsrlrgyeiiddakekienrcpgvsvscadivamaarda vfwaggyyidipkgrfdgkrskiedtrnlpspfnasqliqtfqgrgftppqdvvalsgahtlgvarcassfk arltvpdssldstfantlsktcsagdnaeqpfdatrnfndayfnalqmksgvlfdsqtlfntprtrnlvn gyalnqakfffdqqamrkmsnldvklgsqgevrqncrsin
AtPrx71 NP_2012171	mglvrslcllitflncliivhggatargpvpvsgtrigfylltccpraetivrnnavnagfssdpriapgilr mhfhdcfvqgcdgsilisantertagpnlnlqgfevidnaktqleaacpgvsvscadilalaardtvtlvtq gtgqwvptgrrdgrvslasnannlpgprdsavvqqkfsalglntdrldvllvggthigttagcgvfrnrlfn ttgqtdaptidptflaqlqtcpqngdgsrvlddtgsgstwdtsyynnlrsrgrgvlqsdqvlwtdpatrp ivqqmaprstfnvefarsmvmsnigvvtgangeirrvcsavn
AtPrx25 NP_1816794	mgvylgkycyimiimlvllvlgkevrsqlkngyystscpkasesivrstveshfdsdptispglrlrhfhdc fvqgcdgsvlikgksaeqaalpnlgrlgleviddakarleavcpgvsvscadilalaardsvldsdgpswrv ptgrkdgrislateasnlppldsavvqkqkfqdkgltdhldvlllgahitgqtdclffryrlynfvtvgn sdptispsfltqlklcoppngdgskrvaldigspskfdesffknlrldgnaillesdqlrwsdaetnavvcky asrlrgllgfrfdyefgkamikmssidvktvdgvevrkvcskvn
AtPrx3 NP_1720181	mnclialinsvsfflvigvpiqaqlqmnfyanscpnaekivqdfvsnhvsnapslaaliirmhfhdcfvrg cdgsilinatssnqveklappnltrvgfdidkvsaleskcpgivscadiialasrdavvtggpnwsvp tgrrdgrisnaealanippptsnitnlqtlfanqglldkdlvllsgahtigvshcssftrnlynftrggg qdpaldseyaanlksrkcpnlndnktivempgsrktfdlsyyqlvlkrrglfqdsaltnpttlnsinr iltgsvgsffsefaksmekmgrinvktgsagvvrqcsvans
AtPrx39 NP_1928681	mtrfglallmilviqglvtfseaqlkmgfydqtpyaekivqdvvnqhinnaaplaagliirmhfhdcfvrg cdgsilinatssnqveklappnltrvgfdidkvsaleskcpgivscadiiatlratrdsivaiggptwnv ptgrrdgrisnaeannippfngfttlitlfgnqglvdkdlvllsgahtigvshcssfnrlfnftvgv dqdpaldseyaanlksrrclsiaadnttkvemdpgrntfdlsyyrllvkrgrlfsdaaltmnpaalaqvk rfaggseqeffaeafsnsmekmgrigvktgsdgeirrtcafvn
AtPrx72 NP_2014401	makslniliaalsliafspfclcskaygsgylfpqfydqscpkaeivqsivakafehdprmpasllrlh fhdcfvkgcdasilldssgtiisekrsnpnrnsargfelieekhaleqecpetvscadilalaardstvi tgppswevplgrrdargaslsgsnndipapnntfqtltkfkrrgldlvllvslsgstignsrctsfqr lyngsqngkpdmtlsqyyatllrqrcprsggdqtlffldfatpffkfdnhyfknlimykgllssdeilftkn kqskelvelyaenqeaaffeqfaksmvkmgnispltgakgeirricrrvnhay
AtPrx62 NP_1987741	mglvrslfalvivflscliavvgqgtrigfyttcpnaetivrttvashfgsdpkvapglrlmhnhdcfvqg cdgsvllsgpnsertaganvnlhgfeviddakrqlleaacpgvsvscadilalaardsvsltngqswqvptgr rdgrvslasnvnlpsspsdslaiaqqrkfsafnlrntdrldvllvggthigttaacgfitnrifnssgntadpt mdqtfvplqlrqlcpqngdsarvldtgsntfdtsyfinlsrnrngilqsdhvlwtspatrsivqefmapr qfnvqfarsmvkmsnigvktgtngeirrvcsavn
AtPrx69 NP_2012151	mgrgynllfvlvtflvavtaqgnrgsnsggrrphvgfygnrcrnvesivrsvqvshvrsipanaggi lrmhfhdcfvhgcdgsvllagntsertavpnrsrlrgfevieeakarlekacprtvsadiltlaardavvl tgqqrwevplgrldgrisqasvnlpgpsdvakqkqdfaaaktlntldvllvggthigttagcgvlvrgrfv nfnngtgpdpdsidpsfvplilaqcpqnggtrveldegsvdkfdtsflrkvtsrrvllqsdvlvkwkpetra iierllglrrpslrfgtfklgsmvkmkslievktgsdgeirrvcsain
AtPrx13 NP_1778353	mitialflvlyfhdqlygsaaqlqgfysetcpsaesivrdvqvavntdpgkaavllrlqfhdcfvegc dgsilikhgndderfaagnagvafdvideakselerfcpgvsvcadivalaardaiaekgpfyevptg rrdgliaavdhaknlpdvqdsintlkskfrekglsdqdlvllsagahtigttaeffviprldaqdptinpe ffqilrskcpqgqdvnrpildwdsqfvfdnqifqniknrgvilsdsvlyqdnmkkiiidsyletnqssk anfaadftkamikmgaigvkigaageirrlcsatn
AtPrx2 NP_1962901	mavtnlptcdglfiislivivssifgtssaqlnatfysgtcpnasaivrstiqqalqsdtrigaslirlhf hdcfvngcdasillddtgsiqseknagpnvnsargfnvndiktalenacpgvsvscsdvalalaseasvsla ggpswtvllgrrdsltlanlaganssipieslsnitfkfsavglntndlvalsgahtfgrarcgvfnrnl fnfsgtgndpdtlnstllstlqqlcpqngsastitnldlstpdafdnnyfanlqsdngllqsdqelfsttg sstiaivtsfasnqtlffqafaqsmimngnispltgsgngeirldckkvngs
AtPrx54 NP_1962911	mavtsssstcdgffiiislivivssifgtssaqlnatfysgtcpnasaivrstiqqalqsdariggslirlh fhdcfvngcdgsllddtssiqseknapananstrgnfvndsiktalenacpgivscsdilalaseasvsl agppsvtvlgrrdglntanlsgansslpsfeglnniskfvavglkttdivslsgahtfgrgqcvtfnnr lfnfngtgnpdptlnstllsslqqlcpqngsntgitnldlstpdafdnnyftnlqsnngllqsdqelfsnt gsatvpivnsfasnqtlffeaqvsmikmgnispltgssgeirqdckvvnqssateagdiqlqsdgvpvsv adm
AtPrx22 NP_1813721	mgfspfsfcsaigalilgclllqasnsnaqlrpdfyfgtcfvfdiigniivdelqtdpriaasllrlhfh dcfvrgcdasilldnstsfrtekdaapnansargfnvidrmkvaleracpgrvscadiltiasqisvllsg gpwwpvplgrrdsveaffalantalpspfnlqtktafadvglnrtdslvalsggthfgragqcvfvtprl ynfngtnspdpnlntylvelrrlcpqngngtvlvndvvtpdafdsqyytnlringkqliqsdqelfstpg adtiplvnqysdmsvffrafidamirmgnrlptgtgqeirqncrvnprirrvvenddgvvssi

Окончание табл.

Пероксидаза, NCBI ID белка	Аминокислотная последовательность
AtPrx58 NP_1974881	mglskltiplvllpilmfgvlsnaqltsdfysttccpntvaiarglierasrndvrltakvmrlhfhdcfvng cdgsvlldaapadgvegekeafqnagsldgfeviddiktalenvcpgvvscadilaiaaeisvalagpps1 dvllgrrdgrtairadavaalplgppsleiltskfsvnhldttdlvalsgahtfgrvqcgvinnrlhnfsg nsgqsdpsiepeflqtlrrqcpgggdltaranldptspdsfdndyfknlqnnrgviesdqilfsstgaptv slvnrfaenqnefftnfarmsikmgnvriltgregeirrdcrrvn
AtPrx37 OAP011131	mhssliklglfllliqvslshaqlspsfydktcpqvfdiatttivnalrsdpriaasilrlhfhdcfvngc dasilldnttsfrtekdaafgnansargfvidkmmaavekacpktvscadllaaiaagesvvlaggpswrvp ngrrdslrgfmdlandnlpapfftlnglkdrrfknvglrdasdlvalsggthfgknqcqfimdrllynsntg lpdptlnksylstlrkqcprrngnqsvlvdfdlrtptlfdnkyyvnlkenkgliqsdqelfsspdasdtlpl vreyadgggkffdafakamirmsslspltgkqgeirlncrvvnskskimdvvedalefasm
AtPrx23 NP_1813731	mgfssslscsamgalivgclllqasnsnaqlrpdfyfrcppifniigdtivnelrtdpriaasllrlhfh dcfvrgcdasilldnttsfrtekdaapknsvrgfdvidrmkaaieracprtvscadiitiasqisvllsg gpwwvpplgrrdsveaffalantalpsfstltqlktafadvglnrpsdlvalsggthfgkaqcqfvtpri ynfngtnrpdpslnptylvelrrlcpqngngtvlvndfsvtpttfdrrqyytnllngkqliqsdqelfstpg adtiplvngyssntfvffgafvdamirmgnlkplgtgtqgeirncrvvnprirvveddgvvssi
AtPrx32 NP_8506521	mnfsysslstwttlmtlglcillhssissaqltptfydntcpsvftivrdtdivnelrsdpriaasilrlhfh dcfvngcdasilldnttsfrtekdaapnansargfpvidrmkaavetacprtvscadiltiaaqqavnlag gpswrvplgrrdslqaffalantnlpapfftlpqlkasfnvglrdpsdlvalsggthfgknqcqfimdrl ynfsntglpdptlnttylqtlrgqcprngnqsvlvdfdlrtptvfdnkyyvnlkelkgliqtdqelfsspn atdtiplvreyadgtqkffnafveamrmgnitppltgtqgqirncrvvnsnllhdvveivdfvssm
AtPrx33 NP_1904801	mqfssssitsftwtvlitvgclmlcasfsdaqltptfydtscptvtivrdtdivnelrsdpriagsilrlh fhdcfvngcdasilldnttsfrtekdaalgnansargfpvidrmkaaveracprtvscadmltiaaqqsvtl aggpswkvplgrrdslqafldlananlpapfftlpqlkanfknvglrdpsdlvalsgahtfgknqcqfimd rlynsntglpdptlnttylqtlrgqcprngnqsvlvdfdlrtplvfdnkyyvnlkeqkqliqsdqelfss pnatdtiplvrayadgtqtfnafveamrmgnitppltgtqgqirncrvvnsnllhdvvdvdivfvssm
AtPrx34 NP_1904811	mhfsssststwtlilitlglcmlhaslsaaqltptfydrscpntvntivretivnelrsdpriaasilrlhf hdcfvngcdasilldnttsfrtekdaafgnansargfpvidrmkaaveracprtvscadmltiaaqqsvtla ggpswrvplgrrdslqaflelananlpapfftlpqlkasfrnvglrdpsdlvalsggthfgknqcqfildr lynsntglpdptlnttylqtlrglclplngnrsalvdfdlrtptvfdnkyyvnlkerkgliqsdqelfssp natdtiplvrayadgtqtfnafveamrmgnitppltgtqgqirncrvvnsnllhdvvdvdivfvssm
AtPrx38 NP_1926181	mhssliklglfllliqvslshaqlspsfydktcpqvfdiavntivnalrsdpriaasilrlhfhdcfvngc dasilldnttsfrtekdaafgnansargfvidkmmaaiekacprtvscadmlaiaakesivlaggpswmp ngrrdslrgfmdlandnlpgpsstlkqlkdrrfknvglrdssdlvalsggthfgksqcqfimdrllynfgetg lpdptldksylatlrkqcprrngnqsvlvdfdlrtptlfdnkyyvnlkenkgliqsdqelfsspdadtlpl vrayadgggtffdafvkairmsslspltgkqgeirlncrvvnskskimdvddalefasfm

Приложение 2

Множественное выравнивание аминокислотных последовательностей S-пероксидаз с использованием алгоритма CLUSTAL по MUSCLE (3.8).

Структурные мотивы S-пероксидаз определяли путем выравнивания с референсной пероксидазой TPX1 из *Lycopersicon esculentum*. Зеленым цветом выделены консервативные участки; активный сайт (H43), сайты связывания субстрата (P137) и гема (H167) – красным; лиганды боковой цепи к дистальному (D40 и D48) и проксимальному (D221 и D229) ионам Ca²⁺ – синим; остатки цистеина, участвующие в образовании дисульфидных мостиков 8–89, 41–46, 95–300 и 174–208, – желтым. '*' – аминокислотные остатки, выступающие канал для доступа к субстрату (на основе структур TPX1), закрашены серым. '*' – аминокислотные остатки идентичны во всех последовательностях выравнивания; '.' – консервативные замены; '-' – полуконсервативные замены.

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      |10      |20      |30      |40      |50      |
TPX1      LNFYAKSCPKEAKIKDFVQQQVPKAPNTAAAILRMHFHDCFVRGCGGSLVLLNFTSTNGN
AtPrx39   MGFYDQTCPPYAEKIVQDVVQNHINNAFSLAAGLIRMHFHDCFVRGCGGSLVLLNATSSN-Q
AtPrx3     MNFYANSCPNAEKIVQDFVSNHVSNAFSLAALIRMHFHDCFVRGCGGSLVLLNSTSGN---
AtPrx69   VGFYGNRCRNVESIVRSVQSHVRSIPANAPGILRMHFHDCFVHGCGGSLVLLAGNT----
AtPrx71   NGYYSTSCPKAESIVRSTVESHFSDPTTISPGLLRHMFHDCFVQCGGSLVLLKGS-----
CWPO-C    VGFYATTCRRAESIVRATVQSHFSDSSSIAPGLLRMHFDCFVNGCBASILIDGAN----
HRP       IGFYLTTCPTAEIIVRNAVRAGFNSDPRIAPGILRMHFHDCFVLCGCGGSLVLLSGSN----
AtPrx62   IGFYSTTCPNAETIVRRTVASHFSGDPKQVAPGLLRMHFDCFVQCGGSLVLLSGPN----
      .:*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
      |70      |80      |90      |100     |110     |
TPX1      QTEKLANPNLTLRGFSFIDAVKRLVEAECPGVVSCADIVALVARDAVVATEGPFWNVFTG
AtPrx39   QVEKLAPNLTVRGFDIDKVKSALESKCPGIVSCADIIITLATRDSIVAIGGPTWNVFTG
AtPrx3     -AERDATPNLTVRGFGFIDAIKSVLEAQCPIVSCADIIIALASRDVFTGGPNVSVFTG
AtPrx69   -SERTAVPNRSLRGFEVIEEAKARLEKACPRTVSCADIIITLAARDVAVLTGGQWVFTG
AtPrx71   -AEQAALPNLGLRGLEVIDDAKARLEAVCPGVVSCADIIIALAARDVLDSDGPSWRVFTG
CWPO-C    -TEKTAGPNLLLRGYDVIDAKTQLEAECPGVVSCADIIIALAARDVVLTKGLTWPVFTG
HRP       -TERTAVPNLNLRGFEVIDNAKTQLEATCPGVVSCADIIIALAARDVVLTRGLGWQVFTG
AtPrx62   -SERTAGANVNLHGFEVIDDAKQLEAACPQVSCADIIIALAARDVSLTNGQSQWVFTG
      *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
      |130     |140     |150     |160     |170     |
TPX1      RRDGTISNVSEANGDIPAPTSNFTRLQOSFAKGLDLNDLVLLSGA-HTIGVSRCSSE
AtPrx39   RRDRGISNFAEAMNIPPPFNGFTTLITLFGNQGLVKDLVLLSGA-HTIGVSHCSSEFSN
AtPrx3     RRDGRISNAEALANIPPPSTNITNLQTLFANQGLDLKDLVLLSGA-HTIGVSHCSSEFTN
AtPrx69   RLDGRISQASDV--NLGPGSDSVAKQKQDFAAKTLNLTDLVTLVGG-HTIGTAGCGIVRG
AtPrx71   RKDGRISLATEA-SNLPSPDLSVAVQKQKQDKGLDTHDLVTLVGG-HTIGTQDCLFFRY
CWPO-C    RRDRVSVASNA--NNLPGPRDSVAVQKQKFAAFGLNAQDLVTLVGG-HTIGTTACQFFRY
HRP       RRDRVSVASNA--NNLPGPRDSVAVQKQKFAVGLNTRDLVVLVAGG-HTIGTAGCGVERD
AtPrx62   RRDRVSVASNA--NNLPGSPDLSLAIQQRKFAFRNTRDLVTLVGGHTIGTAAAGFEITN
      *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
      |180     |190     |200     |210     |220     |230     |
TPX1      RLVNFTGVVGTQDFSLDSEYADNLKSRKRSINDNTTIVEMPGSFKTFDLSYFKLLKLR
AtPrx39   RLVNFTGVGDQ-DFSLDSEYADNLKSRRLSIAADNTTKVEMPGSRNTFDLSYRYLVLKR
AtPrx3     RLVNFTGRGGQ-DFALDSEYAANLKSRKCPSLNDNKTIVEMPGSRKTFDLSYQYLVLKR
AtPrx69   RLVNFTGTGQP-DFSIDPSFVPLIL-AQCPQNGG--TRVELDEGSDVKFTDLSFRLKVTSS
AtPrx71   RLVNFTVTGNS-DPTISPSFLTQLK-TLCPNGDGSKRVALDIGSPSKFDESFFKNLRDG
CWPO-C    RLVNFTTNGADESINPSFVSQIQ-TLCPQNGDGSRRIALDTGQNSFSSFFANLRSR
HRP       RLVNFT-----DFNVNQLFLTQLQ-TQCPQNGDGAVRVDLDTGSGTTFDYSYFINLSRG
AtPrx62   RLVNFTSS--GNTADFTMDQTFVPLQ-RLCPQNGDGSARVDLDTGSGNTFTDYSYFINLSRN
      *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
      |240     |250     |260     |270     |280     |290     |
TPX1      KRRGLFQSDAALTRRTSKSFIEQLVDGPLN----EFFDEFKSMKMGGRVEVKTGSAGE
AtPrx39   KRRGLFESDAALTMNPAALAQVKRFAGGSEQ----EFFAEFSNSMEKMGRIQVKTGSAGE
AtPrx3     KRRGLFQSDSALTTNPTTILSNINRILTGVSQ----SFFSEFAKSMKMGRLNVKTGSAGE
AtPrx69   SSRVVLQSDLVLWKPETRAIERLLG-LRR-PSLRFGTGEGKSMVKMSLIEVKTGSAGE
AtPrx71   DGNAILSDQRLWSDAETNAVVKYASRLRGLLGFREDYEFKAMIKMSLIDVKTDFDGE
CWPO-C    SGQGILESDQKLTWDATRTFVQVFLG-VRGLAGLTFGVEFGSRMVKMSLIGVKTGTGGE
HRP       RRGVLESDHVLWTDPATRPIVQQLMS-PRG----NFNAEFARSMVRMSNIGVVTGANGE
AtPrx62   RNRGILQSDHVLWTSPTARSIVQEFMA-PRG----NFNVQFARSMVKMSLIGVKTGTGNE
      .:.*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
      |300
TPX1      IRKHCAFVNS
AtPrx39   IRRTCAFVN-
AtPrx3     VRRQCSVANS
AtPrx69   IRRVCSAIN-
AtPrx71   VRKVCCKVN-
CWPO-C    IRRVCSAIN-
HRP       IRRVCSAVN-
AtPrx62   IRRVCSAVN-
      :*  *  *

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Приложение 3

Множественное выравнивание аминокислотных последовательностей G-пероксидаз с использованием алгоритма CLUSTAL по MUSCLE (3.8).

Структурные мотивы G-пероксидаз определяли путем выравнивания с референсной пероксидазой *A. rusticana* HRP_A2A. Зеленым цветом выделены консервативные участки; активный сайт (H42), сайты связывания субстрата (P139) и гема (H169) – красным; лиганды боковой цепи к дистальному (D43 и D50) и проксимальному (D221 и D229) ионам Ca²⁺ – синим; остатки цистеина, участвующие в образовании дисульфидных мостиков 11–91, 44–49, 97–301 и 176–208, – желтым. Аминокислоты, выстилающие канал для доступа к субстрату (на основе структур HRP_A2A), закрашены серым. '*' – аминокислотные остатки в идентичны во всех последовательностях выравнивания; ':' – консервативные замены; '.' – полуконсервативные замены.

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      | 10      | 20      | 30      | 40      | 50      |
AtPrx2  QLNATFYSGTCPNASAIVRSTIQQALQSDARIGGSLIRLHFHDCFVNGCDGSLLLDDTSS
AtPrx54  QLNATFYSGTCPNASAIVRSTIQQAFQSDTRIGASLIRLHFHDCFVNGCDASILLDDSGS
HRP_A2A  QLNATFYSGTCPNASAIVRSTIQQALQSDTRIGASLIRLHFHDCFVNGCDASILLDDTGS
*****:***:*****:***:***:*****:***:***:*****:***:***:
      | 70      | 80      | 90      | 100     | 110     |
AtPrx2  IQSEKNAPANANSTRGFNVVDSIKTALENACPGIVVSCSDILALASEASVSLAGGPSWTVL
AtPrx54  IQSEKNAGPNANSARGFNVDNIKTALENTCPGVVSCSDILALASEASVSLTGGPSWTVL
HRP_A2A  IQSEKNAGPNVNSARGFNVDNIKTALENACPGVVSCSDVLALASEASVSLAGGPSWTVL
*****.*.***:*****:*****:***:*****:*****:*****:*****:
      | 130     | 140     | 150     | 160     | 170     |
AtPrx2  LGRRDGLTANLSGANSSLPSPFEGLNNTSKFVAVGLKTTDVSLSGAHTFGRGQCVTFN
AtPrx54  LGRRDSL TANLAGANSAIPSPFEGLSNITSKFSAVGLNTNDLVALSGAHTFGRARCGVFN
HRP_A2A  LGRRDSL TANLAGANSSIPSPIESLSNITFKFSAVGLNTNDLVALSGAHTFGRARCGVFN
*****.*****:***:***:***:***.***.***.***.***.***.***:***:***:
      | 190     | 200     | 210     | 220     | 230     |
AtPrx2  NRLFNENGTGNPDPTLNSTLLSSLQQLCPONGSNTGITNLDLSTPDAFDNNYFTNLQSNN
AtPrx54  NRLFNESGTGNPDPTLNSTLLSSLQQLCPONGSASTITNLDLSTPDAFDNNYFANLQSNN
HRP_A2A  NRLFNESGTGNPDPTLNSTLLSTLQQLCPONGSASTITNLDLSTPDAFDNNYFANLQSDN
*****.*****:*****:*****:*****:*****:*****:*****:
      | 250     | 260     | 270     | 280     | 290     |
AtPrx2  GLLQSDQELFSNTGSATVPIVNSFASNQTLFFFAFVQSMIKMGNISPLTGSSGEIRQDCK
AtPrx54  GLLQSDQELFSTTGSATIAVVTSFASNQTLFFQAFQSMINMGNISPLTGSNGEIRLDCK
HRP_A2A  GLLQSDQELFSTTGSSTIAIVTSFASNQTLFFQAFQSMINMGNISPLTGSNGEIRLDCK
*****.***:*.:.*.*****:*.***:*****:*****:*****:***

AtPrx2  VVNGQ
AtPrx54  KVNGS
HRP_A2A  KVNGS
          ***.

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