```
HvUvrD          MSRWKEN--IYPAPPHYGGSS---NPSRLLPCKRPLQSPCPPPRQPLADVTVNALQQPGP 55
OsUvrD          MSRWKEN--ASPLPLHPGGSSSLLPRKRPPPSPPPPQPPCPPPRRPLADVTGNALRQRGS 58
AtUvrD          MENLPPNRGMWNQEYSHGRISQSFRSAKPLLDRKRPIENAPNSSNPLPQRMKESMDTESV 60
                *..   *          *  *      :           .* . .**.:   :::   .

HvUvrD          AGGVEGIDHGYITPLPKGPK-SCGLLLEDDD-MDEAFLLEVDAICEEHSRSMAWKDKGRE 113
OsUvrD          GGG--GCGYGYSTPAPKAPRPSCRFLLDDDEGMDEAFLREVDAICEEHERSSARKDK--- 113
AtUvrD          SHN---INFN-----------STPLMELSANTPYKRLKPEIESYADGHPCG--------- 97
                . .    ...           *  ::  . :   : :  *::: .: *  .

HvUvrD          KDLTVDRGPVVVAAAIHAVPECGTLDDAFWKEAYDIFEECDAQPAAKRQDEELKEMMEEE 173
OsUvrD          -----EAG--EAPPSIPSEPESGVSGDAFRKEENAIGEEGDAQPLATSQ-EEMEDADEEE 165
AtUvrD          --------------LRTPPPRFDLDKEIINGFQTDIYADVGSLSEAFVT-----PLKEPE 138
                                 . *. .   : :      *  : .: . *          * *

HvUvrD          SLVLSCGDDSLLPAISIADDSVKLEDTFWEVNAISKEHHAISSEMNQEHYATSSAINQDE 233
OsUvrD          ICELWFGDDSLPPAISIATGGGEFEDAFWNISDITEEVHHTG----------SSAKCQED 215
AtUvrD          RVTLSNG----CSTSSILDD--DFDDSILEEIDLICEQSARK------------AACQTP 180
                   *  *     .: **  .  .::*:: :   :  *                *  *

HvUvrD          IEEVYVEDGSVALYVDFPPVISIAEEGGEVVDAFLGEVDAMST---AKGKE-SGEMGLEM 289
OsUvrD          MDGKNSDGPSV------PSVICHEEREGELVDAFLEDLDAIHQGDATKGQEEPQETELEI 269
AtUvrD          TTSIYQTPSKD-------NKSSDPKASLDFRDVEKFEPDSNVK---LKLDEETPTIAADP 230
                         .           .  :   :. *.   : *:       * .* .     :

HvUvrD          EENEGCAPRKYYEYLHSLNDKQREASCSDVAVPLMIVAGPGSGKTSTMVGRVLTLLKEGI 349
OsUvrD          EENEGCVPKKYYEYLQSLNDRQREAACSDVTIPLMIVAGPGSGKTSTMVGRVLTLLKEEF 329
AtUvrD          ALLN-SMPDECSKYMLSLNDRQRDAACSNISTPLMVIAGPGSGKTSTMVGRVLVLLNEGL 289
                   : . * :  :*: *****:**:*:**::: ***::****************.**:* :

HvUvrD          SPSNILAMTFTTAAASEMRDRIGAVVGKAVAKEIIISTFHSFCLQLCRTHAEKLGRTSEF 409
OsUvrD          PPSNILAMTFTTAAASEMRDRIGTVVGKAVAKEIVISTFHSFCLQLCRTHAEKLGRTSEF 389
AtUvrD          LPSNILAMTFTKAATSEMRERIGKSAGKKAAKDITISTFHSFSLQLCRMHADKLQRTSEF 349
                 **********.**:****:***  .** .**:* *******.***** **:** *****

HvUvrD          IIYGHGQQRRAIVEAERLLEHGKSDGLGDAVKQCDGDIKN----------SFKDKAKKWL 459
OsUvrD          IIYGNGQQRRAVIEAERLLESDKNNGLGDANKNCDGDIKN----------SFKDKAKKWQ 439
AtUvrD          SVYGHGQQRRAIIEAVRLYEEEKKNGSKTSVPCESGEGLNGAGAGAVCPEYAKDLSKKWQ 409
                 :**:******::** ** *  *.:*   :    .*:  *            ** :***

HvUvrD          KFVTQAKSSGQTPEEYEKKGDLTGASILRHYNEILVSCNALDYHDFINSSITLLTKFPEV 519
OsUvrD          KFVTQAKASGRTPEEYEKKGDLTGASILRHYNEILRSCNALDYHDFINSSITLLTKFPEV 499
AtUvrD          KFVTQGKASGKSPEQCRKMGNEIGAKILGNYNDILKACDALDYHDLISCSVTLLSDFPEV 469
                *****.*:**::**: .* *:  **.** :**:** :*:******:*..*:***:.****

HvUvrD          YKECQTTCQAIVVDEFQDTSAMQYFLLKLLASHNHITIVGDEDQSIFSFNGADVSGFDSF 579
OsUvrD          YDECRNTWQAIVVDEFQDTSAMQYYLLKTLASHNRITIVGDEDQSIFSFNGADVSGFDSF 559
AtUvrD          FKECQDTWKAIIVDEFQDTSTMQYKLLRMLGSHNHITIVGDDDQSIFGFNGADSSGFDSF 529
                :.**: * :**:********:*** **: *.***:******:*****.***** ******

HvUvrD          RRDFPNHKEIRLNKNYRSTRAIVEAATALIRNNTNRCHHKLVETDNPSGSKITVKECHSE 639
OsUvrD          RRDFPNHKEVRLSKNYRSTRAIVEAATALIHNNTKRQSHKLAETDNPSGNKIIVKECHSE 619
AtUvrD          RRDFPNYKEVRLIKNYRSSRHIVEAASSIIKNNTKRCQSKSISSENSQGSKITVKECHNE 589
                ******:**:** *****:* *****:::*:***:*   *  .::*..*.** *****.*
```

```
HvUvrD      DSQCAFVIDKIIETTSS-SAEGRDFGKIAVLYRRQITGKAFQVSFRNRKIPFNVHGVAFY 698
OsUvrD      DSQCAFVIDKIIETTSS-SVEGCHFGKIAVLYRRQITGKAFQASFRNRKIPFNIHGVAFY 678
AtUvrD      EAQCAYVIDKIIEITNDGSTPCCSHGDIAILYRRQVSGKVFQNAFRQRKIPFNVHGVAFY 649
            ::***:******* *.. *.    .*.**:*****::**.** :**:******:******

HvUvrD      RKKVIKAIMAILRTTLPGCDD-GPWRQALKILLPGDKEEKKKIIDHVEKISLARKCSFIS 757
OsUvrD      RKKVIKAIMAILKTTLPGCDDDAPWHQAFKAILPGDKEEKKKIIHHIEKISLARKCSFIS 738
AtUvrD      RKKVVQVILAMLKTTFSECDD-ASYRRVFKALLPFEKEEKKRIIEHIEKISTSRKCSFIS 708
            ****::.*:*:*:**:. *** ..::::.:* :** :*****:**.*:**** :*******

HvUvrD      AATDIFSAKVSGTFKRAQITQGRKVLSTLYSLSKFVEREQSVSAIISSAGNMLPQQYLLE 817
OsUvrD      AATDIFSAKVSGTFKRAQITQGRKVLSALDSLSKLVEREQSVSVVISSAGDMLPQKYLLE 798
AtUvrD      AASDIFNAKISGTFKRSQLTQGRKVLQTLDMVAKLVDREQSLSAVVTCVANMIPQKYLLE 768
            **:***.**:******:*:*******.:*  ::*:*:****:*.:::...:*:**:****

HvUvrD      KRAVIDNDGGKLLNEDNDIRSVLQFLMDDVSDFLSTHFSSSGGASQTEEKGCTATLKAFI 877
OsUvrD      KRAIVDADGGKLLNEDNDIRSVLQFLMDDVSDFLSTHFSSSVDTSKTEEKGCASTLKAFI 858
AtUvrD      QRAVVDNDGGKLLNEDNDLRSVLQYLMDDVAEFISTHCTTTEEEDAIKEKKGCNQLHSFI 828
            :**::* ***********:*****:*****::*:*** :::   .  :**     *::**

HvUvrD      DYISLRETENFRSRKEENKNSITLTTIHQSKGLEWDVVFIVQVNDSEIPLLHEYNGTVKE 937
OsUvrD      DYISLRETENFRSRKEENKNSITLTTIHQSKGLEWDVVFIVQANDSEIPLLHEYNGTVKE 918
AtUvrD      NYISERETENFRSRRRDNENSVTLTTIHQSKGLEWDIVFIVKANENEIPLLHESNGNASE 888
            :*** *********:.:*:**:***************:****:.*:.******* **...*

HvUvrD      AGCTLEEERRLFYVAMTRARKKLYILHVTIDSHRQLLPPSRFLREIPGHLLDIQGEGAA- 996
OsUvrD      AGSTLEEERRLFYVAMTRARKKLYILHVTVDSNRQLLQPSRFLREIPAHLLEVQGEGTV- 977
AtUvrD      SGTSLEEERRLLYVAMTRARKKLFFLYVTVDSNWQVLQPSRFLKEIPGHLLQVQGDMSVN 948
            :* :*******:***********::*:**:**: *:* *****:***.***::**: :.

HvUvrD      --IKYHG-------QPSGDISFDHAEGET-STEKPIANLNETSPYPEPMQSCLAN--DFL 1044
OsUvrD      --RRTPE-------QPVN-IPFDQPEGDT-SVERPMVVRNETSPFPEMDQPCLAN--DFL 1024
AtUvrD      DCRKVHENLPNKTEQSVSSFGTDIKHEESKLTDNDVMNIPEDYASEESIAAYALNGNNFL 1008
               :          *. . :  *  . ::  .:. :    *  .  *   .   *  :**

HvUvrD      KRFEIDDRAVVSHIFHHWAKKQAFQIPKRLLDKIKFVIDERLRGKGYKRKDVLCKLKSLL 1104
OsUvrD      KRFEIEDRAIISHIFHQWAKKQAFQNPKRLLDKIGFVIDERLRGKGYKRKDVLCKLKSFL 1084
AtUvrD      KRFDVEVRSVVSHLFHNWAKKQAFQEPKRLIDKVRFVIGERLAIKKNKHKDVLRALKSSL 1068
            ***::: *:::**:**:******** ****:**: ***.***  *  *:****  *** *

HvUvrD      SDDEALGYAEYVIKWEQIPIDKRSHLMRERQEHFQKQRIENSMGSSEPTPKQISYLRSLG 1164
OsUvrD      SGDEAFGYAQYVIKWEQIPIDKRSHLMRERQEHFQKQRIENSMGSSEPTPKQISYLRNLG 1144
AtUvrD      TSEEAFQYAEHVLRWEQLPADTRAHIVREKQEHFQKLRIENSMGTSEATSKQIAFLHSLG 1128
            :.:**: **::*::***:* *.*:*::**:****** *******:**.*.***::*:.**

HvUvrD      CTITPTSRLHASNLIEKYKSL 1185
OsUvrD      CTITPTSRLHASHLIEKYKSL 1165
AtUvrD      CTVVPTSRLHASRLIEQYKSL 1149
            **:.********.***:****
```

Conserved domains:

UvrD-helicase super family cl14126	UvrD-helicase super family cl14126	UvrD COG0210

www.best.us.edu.pl