

**Supplementary material**

**Comparative analyses of cadmium and zinc uptake correlated with changes in natural resistance-associated macrophage protein (NRAMP) expression in *Solanum nigrum* L. and *Brassica rapa***

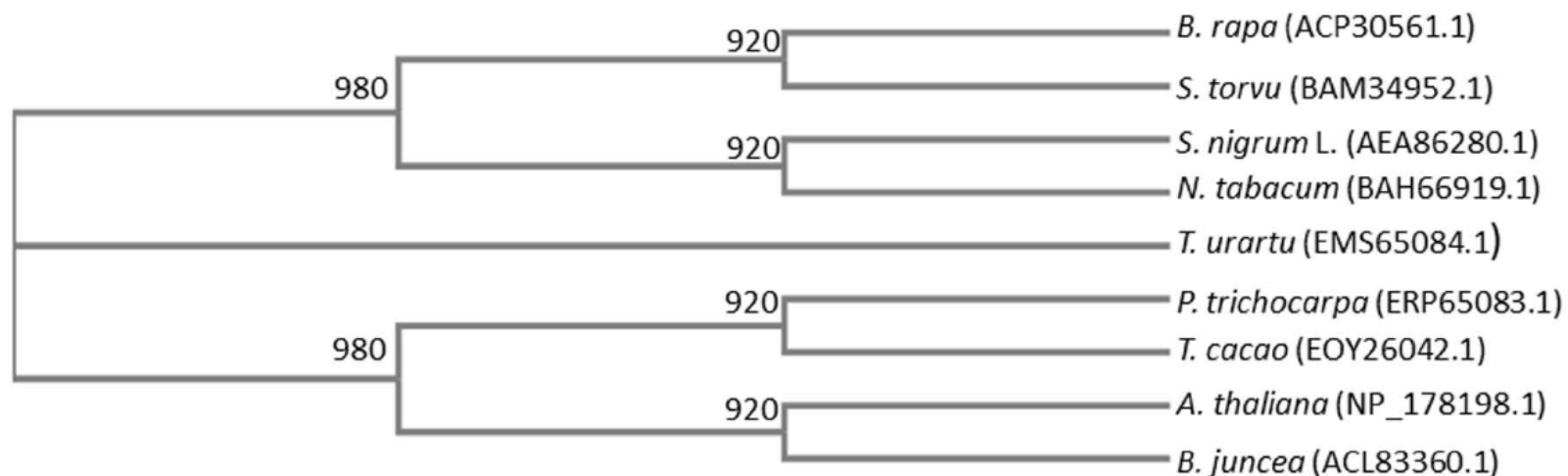
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**Fig S1.** Phylogenetic tree showing the evolutionary distances and clustering of natural resistance-associated macrophage protein (NRAMP) transporters from *A. thaliana* (NP\_178198.1), *N. tabacum* (BAH66919.1), *B. juncea* (ACL83360.1), *S. torvu* (BAM34952.1), *T. urartu* (EMS65084.1), *T. cacao* (EOY26042.1) and *P. trichocarpa* (ERP65083.1) with *S. nigrum* L. (AEA86280.1) and *B. rapa pikenensis* (ACP30561.1).

Consensus nucleotide sequence for plant NRAMP genes	Consensus peptide sequences for plant NRAMP's
<p>5' ATGCTTCAMTCGCTTTCGCAGAGCTAAGCYCAGTGKKWTASWGAGKMMKAARGTATGGCGGGCTSAAMTCG TCYMSRCARCCSCAGTYYATSRCWARYACYGSAACMAGARYYYTTCMAATSHSCCWCTGATYSATGAKWK CRRATACTGATCARATTGKTGRCCMGATAAGAAAACTGGAARAACWTATTYKCATAYRTKGGTCTCTGGW TTCCTTGTTTSAWTTGCMATAYATGATCCTGGAAATTTTSAAACTGYTRCARCKTGGAGCWCARTACAART ATGRGTRCTTTGGATMATMTTASTGGCKTCMTKGTGCTCTTGTSATYCARCCYTKGCWGC SAATYTR GGKGTGTYACAGGGAAGCATTTAGCAGARCAATGYAGARMKGARTATCCYARAGTSCCAAAYTTCATCY TATGGRTMMTWGCWGAATYGCWRTTGTGKGCATGTGAYATTCAGCAARGTATGGACAGCMTTTGCWTTTR AACATGCTSTTCARWATMCCARTWTGGWKTGGTGTSTCKWTSACAWTTGGKCTWCTWSYATTRCART ATGGGGTMMGGAARCTTGAGATTCTKATYKCTWTTCTGTWCTTACMRTWGCTGKRTGCTTYTTKGYGGA GSTTGGMTATGCRARCCSGWSKCYKSWGAGATTCTYMAHGGGCTTYGTCTTCAAAGRAVTTGGTGCRA TRRDCTWGICYATTYCMCTHCTTGGYGCTATKGTATGCCSCACAAYCTTYTCTCCAYTCAGCMCTGGTGC TTTCCAGGARAATYCCWGCATCWGTSMAKGGCATYARRGAVGCWTCGAGATWTTATMTRATMGAAAGTGGY YTKGCTTGATGGTGGCWTCTCTYAAAYRTMTCMRTTATYTCWGTMASTGGWGCWGTYTCMATTCCYCWMMT ATGAVYSCAGAWGAYCRRGMKARSTGTGAGGAYTTAGAYTTGAACAARGCAARGCCTKTYTTACTMMRA AAYGTYTTAGGBARYTGAGTTMAARCTWTTTGAATGCTTRCTWGCWTCRGGDCAGAGAGTTCKACWAT AACTGGRACATAYGCYGGYCAATAYGTWATGCAGGGYTTCTTGATTRCGRCTRAARCCRTGGMWMMGRA ACTTCTTAACCGWWGCTTRGCHATWGYCCWAGTTARTTGKCKWMTYATGGWCGGCKCTGSTGGG CTGGARASYTRATYATYGCCTCGATYTTATCTTGAAGCTSCCYTTTGTCTCTATTCCAYTKCTCAAR TTCACMAGCAGTRARACCAAGATGGGKMACATGYMAAYCARYTGCGGTTTACGWCWYMRCTGRTYATTG GYWCMYTRATCATGGGWATAAAAYATATATCTAGSWGASRAGTTKSWTMCATYCTYMWKSAKAGY ATYTAGGAAACTKRYKGYTRWGGTGTYYTTGTGGAATATTWGGCAYTTGTGKTKTKYARTTTATYTGCC TGCAATATYGTACTYGGCTTCTATCCGAMMWAATAAGRAARGCAGCAGCACCCACCGATCTATTGGA TGCTCTCGACCATCCCTACTCCACAACCTCTCTCGGTACCATTCTCAGGTTTAGAGCTTGCGCCAT GGTTGAACCTGATCTTAGGTTGATCCACTTCTCCCTACATTGTATCCAGATATGTTGCCGTTTCACTG ACAGATTCGAAACAGCTTTCAGTCTTTGGTTCAGCCACATAGCTTACGCCATATCATCAGAAGGGTAGT CATCTGTTTATATTGACTGCCGTCTCTTCTAAACAGAGATAATGCTACTCCAGACGAACCTAATTACAA TCAAGTTTGACATTGAGTTCCGATCATTGAGGACCGCTCTATTTTATACTCAAAGGATGTGGTATACGAA TCTTTGAGGATCATTGCCATCTCCAGATAACCAACCTGATAATGTGAGCTCCACGTTAGGTGATAGCTAGA TGGGCTCTGCCACATCTACCAAACGGAACGCTTTAAAGATTTAAGCTTGGCTCTCAATGGCGCAAAGCA TCAGTTTTTAAACGCCGTGCACGTGGAGAATGA 3'</p>	<p><b>Reading Frame 1.</b> MLXSLSQS-XQXXXEXXXMAGXXRXXXSXXXXXRXXXXXX-XMXXXTDXIXXXDKKN WXNXXXXXGPFVXXXXDPGNFXTXXXWXXXQXVXLDXXGXCCSCXXXXXXXXXX XXREAFSXXXXXSRXQXSXYXXXKXLLXHVFXLXLXQLXLTCSXXXXXXVXXX XLXXXXXXYGVXXLELXXXCYXXXLXXGXWXCXXXSXXAXVLOXXGXTXX IXLXAXVMXHXXLXSLVLSRXXXRXGXGXXCRXYXESXA-WWFXXXXLXXX XXXXIXX-XQXXXXVXX-X-TXQLXXTXIXXRXEXXXFXIAXXXXREFXXNWXIX XXNXXCRXS-FXXXXXXLS-LXAXXXXVXLXXXLXXGXGAGXXXXXXSLXFXEFA XIPXLPXSSXTKMXHXXXAVSXXXXWXXXHGKXYXI-XSXXHXXXXXHGXNXX XCXGIXGXXXXXLXGCSXXYASIRXNXXDDAPTDLLDAL-PSLYSTLRYHSSGL ELAPWLNLLGCIHFPLTLLSRYVAGSVTDETAFSPLVSHIASRHIIIRRVVICLYAV SF-TEIMLLQTNLITIKFALSSVSLTALFLYSKDVVYESLRHIAHLQTNLIM-APR-V -LDGLCHILPNTSLKI-RWLSMAQSISF-NAVHVEN</p> <p><b>Reading Frame 2.</b> CFXRFRRAKXSXXXXVWRAXXVXXXXVXXXXKXXXXXXDX-XXILILXXXIRKT GXYYHXVXLSLFLXLLXLEIXLXXXGXYYXXLWXXLXXXAALXXXSXXXNXX XTGHLAXXXRXXYXXGXKHXMXXXXNXXCXM-XS-XXWXSXXHAXXXXXXXWXXX XWXXXXXXMGXGLRFXXXLXLLXAXCXXXEXXYXXXXXVXXGLFFKXXVXXXX XXXLXLXCTXXXGXQWCPGXXDXXXAXXXXADXXXXVXXLDGGXXXXXXVXXW XXXFXYYXRXXXX-GXRXEQXAXLXXXLXWSXXXLXXXXXEXXITXTXX XPIXA GLDXXXXWXXNFXNSLXXXFXCXXXVXXLGLXXXXXRXXLSXXX FXXSXSAXXPRWXXMXXXRFQXXLIXXXIMXIKIXSXXVXXTXXXXX-ETXXX GXFEYXAXVXXXVAAVXCXWLSXXIXXATTHPPYWMMSDHPSTPQLSLGTILQV- SLRHG-T-S-VVSTFSLHCYPMPLVQ-QIRKQLSVLWSAT-LHAISSEG-SSVYI-LPS PSQR-CYSRR-LQSSLH-VPYH-GPLYFYQRMWYTNL-GSLPISR-PT-CELHVR S-MGSATSYQTERL-RFNVGSQWRKASVFKTPTWRM</p> <p><b>Reading Frame 3.</b> ASXAFELSVXXXXXYGGXSXXXQXXXXXNXXXXNXXLXXXXY-SXCXX-EKL EXXIXXSWXPCXXCXXSXFXXNXXLEXTXMXFXGXVXXLLLXXXXXXX XQGS-I-QXXXXXIXXPFXWXXXEXXXACXIPXXIXTFXXNMXFXXPWXXGXOXT XXSXXIXXXWGXEX-DSXXXLXLLXAXXXLXMXXXXXXFXGXFXSXXVXXXX XXXWXXYAXQXXXPXSXGAFQXNXXIXXXHXXXQXLLXXXKWXLMVFXXXXXXXX XXCXXXMXXXXXXCXLXNXAXPXYYXXX-XGVXXXNXXXXXXQVXX-LXHX XQXXMQXFLXXXXXXXFTLTXXXXXXSLXXXIXRXXWGWXXXXXXDXIX-AXXCS XXQXHXQXQDGTXXXGFSXXXLXXXSX-XIXYXXXXXXXXXXXRXXXX VXLWNIXXXXXFXWLQYVXGFPXX-XXRRRTHRSIGSLTIPLLHNSLVPFRFR ACAMVELDLRLPLSPYIVIQICRFSDFRNFSGFSFGPHSFPYHQGSHLFIQDRL LLNRDNATPDELNYNQVIEFRIEDRSIFILKGCGRIFEDHCFSPDNQPDVNSVTLGV ARWALPHPTKRNVFDLTLALNGAKHQFLKRRARGE-</p>

**Fig S2.** Consensus nucleotide and peptide sequences for natural resistance-associated macrophage protein (NRAMP) transporters of *A. thaliana* (NP\_178198.1), *N. tabacum* (BAH66919.1), *B. juncea* (ACL83360.1), *S. torvu* (BAM34952.1), *T. urartu* (EMS65084.1), *T. cacao* (EOY26042.1) and *P. trichocarpa* (ERP65083.1) with *S. nigrum* L. (AEA86280.1) and *B. rapa pikenensis* (ACP30561.1).