

Molecular characterization of a *WRKY* gene from *Oryza sativa indica* cultivar UKMRC9

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Group 1

OsWRKY24_N SQRRSSDDGYNWRKYGQKQVKGSENPRSYKCTFPNCP TKKKKVERS LDGQITEIVYKGT HNAK P
 AtWRKY33_N REQRKGEDGYNWRKYGQKQVKGSENPRSYKCTFPNCP TKKKKVERS LEGQITEIVYKGS HNH PKP

Group 2a

AtWRKY40 DTTLVVKDGYQWRKYGQKVT RDNPSPRAYFKCACAPSC SVKKKQVRSVE DQSVLVATYEGE HNH PMP
 OsWRKY62 SMAETVKDGYQWRKYGQKVT RDNPYPRAYFRCAFAPSC PVKKKLQRCAE DRSM LVATYEGE HNH ALS

Group 2b

OsWRKY5 SEAPMISDGCQWRKYGQKMAKGNPCPRAYYRC TMA SQC PVRKQVQRC AKDKS ILI TTYEGT HSH PLP
 AtWRKY47 SDATTVNDGCQWRKYGQKMAKGNPCPRAYYRC TMA VGC PVRKQVQRC AE DTTILIT TTYEGN HNH PLP

Group 2c

OsWRKY29 SEIDHLEDGYRWRKYGQKAVKNSPFPRSYYRC TNSKCTVKKRVERS SDDPSV VIT T YEGQH SHHTV
 AtWRKY57 SDVDNLEDGYRWRKYGQKAVKNSPFPRSYYRC TNSRCTVKKRVERS SDDPSIVIT T YEGQH CHQTI

Group 2d

AtWRKY21 KVADIPDDYSWRKYGQKPI KGSPPYPRGYKCSSMRGC PARKHVERCLE DPAMLI VTYEAE HNH PKL
 OsWRKY25 RVADIPADEYSWRKYGQKPI KGSPPYPRGYRC STVKGC PARKHVERAADDPATLVVTYEGD HNH SPP

Group 2e

AtWRKY65 GDTTPPSDSWAWRKYGQKPI KGSPPYPRGYRC SSSKGC PARKQVERS RDPTMILIT YTSE HNH PWP
 OsWRKY14 GEGNTPTDSWAWRKYGQKPI KGSPPYPRAYYRC SSSKGC PARKQVERS RN DPDTVI VTYSE HNH SAT

Group 3

OsWRKY18 LTPIPHTDGHWRKYGEKKI KNSSFPRLYRC SYRDDRN CMATKV VQEN DADPP LYRVTYIHPHT CNPS
 OsWRKY15 QDVGPLDDGFSWRKYGQKDI LGAKYPRAYFRCTHRHTQG CHAS KQVQRA DGDPLL FDVVYHGDHT CAHG

OsWRKY70_N QSRRSSDDGYNWRKYGQKQMKGSENPRSYKCTFPGCP TKKKKVEQSPDGQVTEIVYKGAHSHPKP
 AtWRKY25_N MVS RNSNDGYGWRKYGQKQVKKSENPRSYFKCTYPDCVSKKIVETASDGQITEI IYKGGH NHPKP
 OsWRKY57_AKN SLSYDGYSWRKYGQKQVKGSEFP RSYKCTHTPTCPVKKR VEMTPDGRIAEIVYNGE HNH PKP
 AtWRKY44_N TGD RSSVDGYNWRKYGQKQVKGSECP RSYKCTHPKCPVKKKVERS VEGQVSEIVYQGE HNH SKP
 HvWRKY42_N TNSNPGEDGYNWRKYGQKQVKSSSEHPRSYKCTHPDCPVKKKVERS QDGQITEIVYKSSH NHPLP
 AtWRKY2_N AGGAP AEDGYNWRKYGQKLVKGSEYPRSYKCTNPNCQVKKKVERS REGHIT E I IYKGAH NHLP
 AtWRKY34_N ACCAPADDGYNWRKYGQKLVKGSEYPRSYKCTHPNCEAKKKVERS REGHIT E I IYTG DHI HSKP
 OsWRKY35_N AAAAVAEDGYSWRKYGQKQVKHSEYPRSYKCTHASCAPVKKKVERS SHEGHVTEI IYKGT HNH PKP
 OsWRKY78_N VAEKSAEDGYNWRKYGQKHVKGSENPRSYKCTHPNCDVKKLLERSLDGQITEVVYKGRH NHPKP

hvWRKY46_N VADKSADDGYNWRKYGQKHVKGSENPRSYKCTHPNCEVKKLLERAVDGLITEVVYKGRHNHPKP
 OsWRKY4_N AIEQPAKDGYNWRKYGQKQLKDAE SPRSYKCTRDCFPVKKIVERSSDGCIKEITYKGRHSHPRP
 OsWRKY82_N VSVNMGVDGFNWRKYGQKQVKSSENSRSYYRCTNSNCLAKKKVEHC PDGRVVEIIRGTHNHEPP
 OsWRKY24_C SDIDILDDGYRWRKYGQKVVKGNPNPRSYKCTTAGCFVRKHVERASHDLRAVITTYEGKHNHDVP
 OsWRKY70_C SDIDILDDGYRWRKYGQKVVKGNPNPRSYKCTTAGCFVRKHVERASNDLRAVITTYEGKHNHDVP
 OsWRKY53_C SDIDILDDGYRWRKYGQKVVKGNPNPRSYKCTTVGCFVRKHVERASHDTRAVITTYEGKHNHDVP
 OsWRKY30_C SEVDILDDGYRWRKYGQKVVKGNPNPRSYKCTHPGCSVRKHVERSSHDLKSIVITTYEGKHNHEVP
 OsWRKY80 SEVDILDDGYRWRKYGQKVVKGNPNPRSYKCTHQGCSVRKHVERASHDLKSIVITTYEGKHNHEVP
 HvWRKY42_C SEVDILDDGYRWRKYGQKVVKGNPNPRSYKCTHQGCSVRKHVERASHDLKSIVITTYEGKHNHEVP
 OsWRKY78_C SEVDILDDGYRWRKYGQKVVKGNPNPRSYKCTNTGCFVRKHVERASHD PKSVITTYEGKHNHEVP
 PpWRKY4 SDVDILDDGYRWRKYGQKVVKGNPNPRSYKCTNVGCFVRKHVERASNDPKAVITTYEGKHNHDVP
 HvWRKY41_C SDVDLLDDGYRWRKYGQKVVRGNPNPRSYKCTYQGDVKKHVERSSEQEPHAVITTYEGKHTHDVP
 OsWRKY4_C SEVDLLDDGYRWRKYGQKVVKGNPNPRSYKCTADGCNVRKQIERASADPKCVLITYTGRHNHDPP
 OsWRKYUKM NNGGLADDGYKWRKYGQKSIKNSPNPRSYRCTNAPRCNAKKQVERAVDEPDTLITYEGLHLHYTYS
 OsWRKY28 DLSLVVKDGYQWRKYGQKVT KDNPCPRAYFRCSFAPACPVKKKVQRSAEDNTVLVATYEGEHNHAQF
 OsWRKY71 DLSLVVKDGYQWRKYGQKVT KDNPCPRAYFRCSFAPACPVKKKVQRSAEDNTILVATYEGEHNHGQP
 HvWRKY1 DLSLVVKDGYQWRKYGQKVT KDNPCPRAYFRCSFAPACPVKKKVQRSAEDKTILVATYEGEHNHTQP
 HvWRKY2 DLSLVVKDGYQWRKYGQKVT KDNPCPRAYFRCSFAPACPVKKKVQRSAEDKTIVLVATYDGDHNHAPP
 HvWRKY23 DLSLVVKDGYQWRKYGQKVT KDNPCPRAYFRCSFAPACPVKKKVQRSAEDKTIVLVATYDGDHNHAPP
 OsWRKY76 DTSLVVKDGYQWRKYGQKVT RDNPSPRAYFRCAFAPACPVKKKVQRSAEDSSLLVATYEGEHNHHPH
 HvWRKY3 DTSLVVKDGYQWRKYGQKVT RDNPSPRAYFRCAFAPACPVKKKVQRSAEDSSMVEATYEGEHNHPRP
 OsWRKY43 SDA PMISDGCQWRKYGQKMAKGNPCPRAYRCTMAAGCFVRKQVQRCAEDRTVLIITYEGNHNHPLP
 OsWRKY1 SEAPIIADGCQWRKYGQKMAKGNPCPRAYRCTMAAGCFVRKQVQRCAEDRSILIITYEGT HNHPHP
 OsWRKY9 KPRVSIADGCQWRKYGQKMAKGNPCPRAYRCTMAAGCFVRKQVQRCAEDKTIVLIITYEGNHNHQLP
 OsWRKY32 CQPTMNDGCQWRKYGQKVAKGNPCPRAYRCTVAPGCFVRKQVQRCAEDMSILVITYEGT HNHPHP
 AtWRKY9 CETATMNDGCQWRKYGQKIAKGNPCPRAYRCTVAPGCFVRKQVQRCAEDMSILIITYEGT HNHPHP
 AtWRKY72 CDTPTMNDGCQWRKYGQKIAKGNPCPRAYRCTVAPGCFVRKQVQRCAEDMSILIITYEGT HSHSLP
 HvWRKY37 CDTPTMNDGCQWRKYGQKIAKGNPCPRAYRCTVAPGCFVRKQVQRCAEDMSILIITYEGT HSHPLP
 OsWRKY73 CDAPTMNDGCQWRKYGQKIAKGNPCPRAYRCTVAPGCFVRKQVQRCAEDMSILIITYEGT HNHPHP
 AtWRKY61 KTRVSMNDGCQWRKYGQKIAKGNPCPRAYRCTIAASC FVRKQVQRCAEDMSILIITYEGT HNHPHP
 OsWRKY27 CSAPTVKDGCQWRKYGQKIAKGNPNPRSYRCTGAPGCFVRKQVQRCAEDMSILVITYDGVHNHPIT
 OsWRKY3 SEIDHLEDGYRWRKYGQKAVKNSPFRSYRCTNSKCTVKKRVERSDDPSVVIITYEGQCHHTA
 OsWRKY8 SEVDHLEDGYRWRKYGQKAVKNSPFRSYRCTAPRCGVKKRVERSEQDPSMVIITYEGQHTHSP
 OsWRKY11 SEVDHLEDGYRWRKYGQKAVKNSPFRSYRCTTPKCGVKKRVERSQDPSSTVITYEGQHTHSP
 AtWRKY23 SEVDHLEDGYRWRKYGQKAVKNSPFRSYRCTTASCNVKKRVERSFRDPSSTVITYEGQHTHSP
 OsWRKY16 SEVDHLEDGYRWRKYGQKAVKNSPFRSYRCTTQKCFVKKRVERSQDPAVVITYEGKHTHPHP
 OsWRKY49 SEVDHLEDGYRWRKYGQKAVKNSPFRSYRCTTQKCFVKKRVERSQDAAVVITYEGKHTHPHP
 OsWRKY7 SEIEILDDGYKWRKYGKSVKNSPNPRNYRCTSTEGCNVKKRVERDKDDPSYVVIITYEGTHNVSP

HvWRKY18 SEEIILDDG YKWRKY GKKS VKNS PNP RNY YRC STEG CNVKKR VERDKDD AXFVVT MYEGVHNHAS
OsWRKY26 SDDEIILDDG YKWRKY GKKS VKNS PNP RNY YRC STEG CNVKKR VERDKND PRYVVT MYEGIHNVCP
OsWRKY59 SDDEIILDDG YKWRKY GKKS VKNS PNP RNY YRC STEG CNVKKR VERDKND PRYVVT TYEGIHNVCP
HvWRKY17 SEVEIILDDG FKWRKY GKKA VKNS PNP RNY YRC SAEGCGVKKR VERDRDD PRYVVT TYDGVHNHATP
OsWRKY67 SEVEIILDDG FKWRKY GKKA VKNS PNP RNY YRC STEG CNVKKR VERDREDHRYVIT TYDGVHNHASP
HvWRKY16 SEVEIILDDG FKWRKY GKKA VKNS PNP RNY YRC STEG CNVKKR VERDREDHRYVIT TYDGVH TNPLP
OsWRKY77 SEVDVLLDDG YRWRKY GKKM VKNS PNP RNY YRC SSEGCRVKKR VERARDDARFVVT TYDGVHNHPAP
OsWRKY36 SDVDVLLDDG YKWRKY GQKV VKNS LHP RSY YRC THNNCRVKKR VERLSEDCRMVIT TYEGRHTHTPC
AtWRKY12 SDVDVLLDDG YKWRKY GQKV VKNS LHP RSY YRC THNNCRVKKR VERLSEDCRMVIT TYEGRHNHIPS
OsWRKY34 SEVDVLLDDG YKWRKY GQKV VKNS LHP RSY YRC THSNCRVKKR VERLSTDCRMVIT TYEGRHTHSPC
OsWRKY79 SDVDVLLDDG YKWRKY GQKV VKNT QHP RSY YRC TQDNCRVKKR VERLAEDPRMVIT TYEGRHVHSPS
HvWRKY14 SDVDVLLDDG YKWRKY GQKV VKNT QHP RSY YRC TQDKCRVKKR VERLAEDPRMVIT TYEGRHVHSPS
AtWRKY13 SEVDVLLDDG YRWRKY GQKV VKNT QHP RSY YRC TQDKCRVKKR VERLADDPRMVIT TYEGRHLHSPS
PpWRKY6 SEVDVILDDG YKWRKY GQKPV KSSPH RNY YRC TTANCPVRKR VERSIEDPGLIVT SYEGHTHPKI
PpWRKY7 SEVDVILDDG YKWRKY GQKPV KSSPH RNY YRC TTANCPVRKR VERSIEDPGLIVT SYEGHTHPKI
PpWRKY3 SEI DVMEDG YKWRKY GQKAV KDS PF RSY YRC TNQTC PVRKR VERKAGDAGLVVT TYEGTHSHLSP
OsWRKY23 SDNDILDDG YRWRKY GQKAV KNS KHP RSY YRC THHTCNVKKQVQRLAKDTSIVVT TYEGVHNHPCE
HvWRKY13 SENDVLLDDG YRWRKY GQKAV KNS AFPRSY YRC THHTCNVKKQVQRLAKDTSIVVT TYEGVHNHPCE
OsWRKY6 KVADI PSDN YSWRKY GQKPI KGS PPH RGY YRC SSKKDC PARKH VERCRSDPAMLLV TYENE HNHAQP
HvWRKY11 KVADI PSDN YSWRKY GQKPI KGS PPH RGY YRC SSIKDC PARKH VERCRGDAGMLIVTYENDHNHAQP
OsWRKY68 KIADI PPDE YSWRKY GQKPI KGS PYP RGY YKC STVRGC PARKH VERATDDPAMLVV TYEGERHHTPG
HvWRKY7 KIADI PPDE YSWRKY GQKPI KGS PYP RGY YKC STVRGC PARKH VERALDDPAMLVV TYEGERHHSFG
HvWRKY8 KISDI PPDE YSWRKY GQKPI KGS PPH RGY YKC STVRGC PARKH VERCVDEPAMLVV TYEGERHSHNRL
AtWRKY7 KMADI PSDE FSWRKY GQKPI KGS PPH RGY YKC SSVRGC PARKH VERALDDAMMLIVTYEGDHNHALV
HvWRKY9 KVADI PADE FSWRKY GQKPI KGS PPH RGY YKC SSVRGC PARKH VERCVDDPAMLVV TYEGDHNHNRA
AtWRKY15 KMSDVPDD YSWRKY GQKPI KGS PPH RGY YKC SSVRGC PARKH VERAADDSSMLIVTYEGDHNHSL
PpWRKY1 KLADI PSDE YSWRKY GQKPI KGS PPH RGY YKC SSIRGC PARKH VERSME DSSMLIVTYEGDHNHPQS
OsWRKY44 RVADI PADE YSWRKY GQKPI KGS PYP RGY YRC STVKGC PARKH VERAADDPATLVV TYEGDHRHSFP
OsWRKY51 KVADI PADD FSWRKY GQKPI KGS PYP RGY YKC STLRGC PARKH VERDPADPSMLIVTYEGERHHTPS
HvWRKY10 KAAEIPADD FSWRKY GQKPI KGS PYP RGY YKC STVRGC PARKH VERDPS DPSMLIVTYEGERHHSFA
OsWRKY42 RNADI PADD YSWRKY GQKPI KGS PYP RGY YKC STVRGC PARKH VERDPGEPAMLVV TYDGDHRHGEP
OsWRKY37 SGEVVPDDLWAWRKY GQKPI KGS PYP RGY YRC SSSKGC SARKQ VERSRTDPNMLVITYTSEHNHPWP
OsWRKY66 SGEVVPDDLWAWRKY GQKPI KGS PYP RGY YRC SSSKGC SARKQ VERSRTDPNMLVITYTSEHNHPWP
OsWRKY2 GGEVVPDDLWAWRKY GQKPI KGS PYP RGY YRC SSSKGC SARKQ VERSRADPTMLVVITYTSDHNHPWP
HvWRKY39 GEGPPPPDSWAWRKY GQKPH QGSPYP RGY YRC SSFKGC PARKQ VERSRTDPTVLLVITYSYDHNHPWP
OsWRKY13 GEGPPPSDSWAWRKY GQKPI KGS PYP RGY YRC SSSKGC PARKQ VERSRADPTVLLVITYSFEHNHPWP
OsWRKY12 ADGGVSSDLWAWRKY GQKPI KGS PYP RGY YKC SSMKGC MARKM VERSPAKPGMLVVITYMAEHCHFPV
AtWRKY16 DRGSRSSDLWVWRKY GQKPI KSS PYP RSY YRC ASSKGC FARKQ VERSRTDPNVSVITYISEHNHPFP

OsWRKY39 PADGVSADVWAWRKYGQKPIKGSPPYPRGYRCSSSKGC PARKQVERSRS DPNTFI LTYTGEHNHSAP
 OsWRKY19 QDTASLDDGLSWRKYGQKDI LGAKYPRAYFRCTRHRTOGCNATKQVQRADGDPLLFDVVYLG DHTCGQA
 OsWRKY41_C QDVGPLDDGYSWRRYGLKDI LGAKYPRSYFRCTRHRTOGCVATKQIQRRDGDPLLFDVVYHGDHTCSER
 OsWRKY69 GAE GPADDGHSWRKYGQKDI LGAKHPRGYRCTRHRTOGCTATKQVQRTDDDASLFDVVYHGEHTCRPG
 HvWRKY30 GAE GPDDGHSWRKYGQKDI LGAKHPRGYRCTRHRNSQGCTATKQVQRADEDPVLFDVVYHGEHTCRPT
 HvWRKY22 GAETPVDDGHSWRKYGQKDI LGAKHPRGYRCTRHRNSQGCAATKQVQRADEDPTLFDVIYHGEHTCIH
 HvWRKY28 GADAPADDGHSWRKYGQKDI LGAHPRAYRCTYQKTQGCAATKQVQRADEDPALFDVIYHGEHTCLHK
 OsWRKY74 VENPFVDDGHSWRKYGQKEI LGAKHPRGYRCTRHRNSQGMATKQVQRTDEDAMVFDVIYHGEHTCVHK
 OsWRKY48 EKARTSEDGFLWRKYGQKEI KNSKHPRLYYRCSYKDDHGCTATKQVQSEEDPSLYVITYFGDHTCSQ
 HvWRKY4 VTARTLNDGKTWRKYGQKCI HACTNPRSYRCSHKPDQGCQATRQVQESDSSPSEYLISSYQHTCKDP
 OsWRKY45 VVVKNLDDGQAWRKYGQKEI QNSKHPKAYFRCTRHKYDQMCTAQRQVQRCDDDPAS YRVTYI GEHTCRDP
 HvWRKY32 KMKSLLEDGQTWRKYGQKEI QNSKHSKAYFRCTRHKYDQCCPARRQAQRCDPDTYRVTYI GVHTQDP
 HvWRKY34 DTYAPYDDGHQWRKYGEKKLSNSNFPFRFYRCTYKTDLKPATKQVQKQDMSDPP LFTVYFNHSCNTT
 HvWRKY33 DTFAPHNDGHQWRKYGEKKI NNCNFRPYRCTYKDNMNCPATKQIQKDHSDPP LYQVTTYNEHSCNSA
 OsWRKY50 VTTVPDFDGYQWRKYGQKQIEGAMYPRSYRCTNSTNQGLAKKTQVRNGGGGAAGYTVAYISEHTCKSI
 OsWRKY65 VTTVPDFDGYQWRKYGQKQIEGAMYPRSYRCTNSTNQGLAQKTQVRNGGGGAAGYTVAYISEHTCKSI

NONE ARABIDOPSIS, ORYZA AND HORDEUM SEQUENCES

Tawrky2 APADDGRSWRKYGQKDI LGAQHPRAYRCTYQKTQGCAATKQVQRADEDPALFDVIYHGEHTCVH
 TaWRKY3 KQVEDGYNWRKYGQKQVKGSENP RSYYKCTYNNC SMKKKVE RSLADGRITQIVYKGAHDHPKPLS
 TaWRKY3 KQVEDGYNWRKYGQKQVKGSENP RSYYKCTYNNC SMKKKVE RSLADGRITQIVYKGAHDHPKPPS
 ZmWRKY1 LTVKDG YQWRKYGQKVTRDNPS PRAYFRCA YAPSC PVKKKVQRSAE DSAMLVATYEGEHNHPSPT
 ZmWRKY2 LTVKDG YQWRKYGQKVTRDNPS PRAYFRCA YAPSC PVKKKVQRSAE DSAMLVATYEGEHNHPSPT
 ZmWRKY3 TKLEDGYNWRKYGQKQVKGSENP RSYYKCTYHSC SMKKKVE RALADGRITQIVYKGAHNHHPKPLS
 CsWRKY1 QPSYDGYNWRKYGQKQVKGSEYPRSYKCTHPSCPVKKKVE RSLDGKVAEIVYKGEHNHPKPQPL
 MtWRKY1 RPSYDGYNWRKYGQKQVKGSEYPRSYKCTYPNCPVKKKVE RSLDGEIAEIVYKGEHNHGKPOHQ
 GmWRKY1 KPNNDGYNWRKYGQKHVKGSDFRSYKCTRPNC PVKKKLE RSLGHTVTAI IYKGEHNHQRPHRS

Supplementary Fig. 1 Reference sequences used to classify into Groups

