
1 Supplemental Data

2 Supplemental Figure S1.

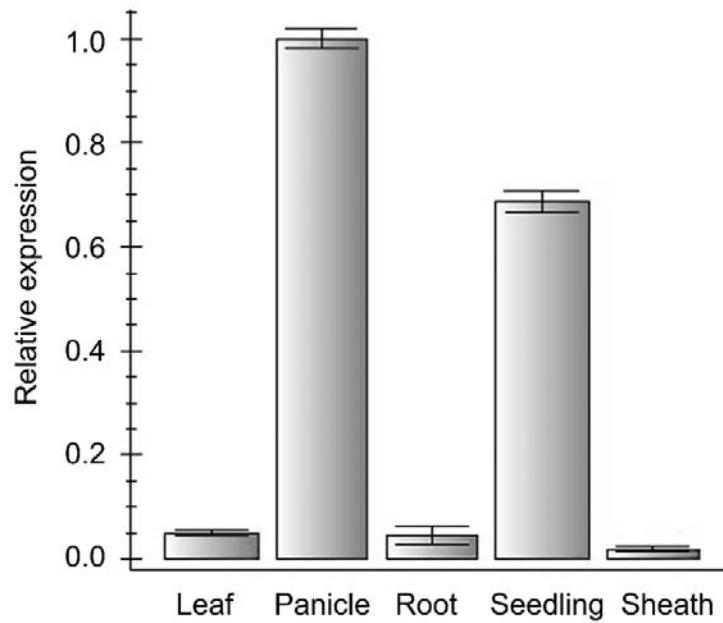
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Gm XP_003555794	[EEE---EDP---TPD-AQ-CQ-DC-HG-VDA-SC-SR--RHQD-WELSEP-GIVV-I-VE-SG-CLOK-KT-K-B-EFMEYVAAE--G-RPR-QG/SQ-CLLVDCNTPSSA	94
Hs NP_002844	[PQQIQQIQQD-EDD-AQ-CQ-DC-HG-VDA-SC-SR--RHQD-WELSEP-GIVV-I-VE-SG-CLOK-KT-K-B-EFMEYVAAE--G-RPR-QG/SQ-CLLVDCNTPSSA	98
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Dm NP_477440	[DVEPSPYGD-CR-FAR-EH-KTFIAKS-KC-FNDY--GMVQ-SEDCG-TR-EV-GKS-104-T-A-PPG-PEM-EPVQDF---OC-GV-IC-NLSE-LSLFGS	94
Ce NP_499521	[MEL---ETGQ-CTI-ELRKEN-KE-AQEVKA-A-FD-T-GTHA-SEAGAK-T-DGDSYQH-SV-LINPAFESS-XVREBI---VSMR-SIKS-SEFS-SEN	93
Sp NP_594809	[FQ---A-ZY-C-O---KQ-LOST-RC-D-SKE-C-T-EL-MSK-REA-E-SQS-LQ-HA-LD-S-1507-N-EGDSDDTY-N-Q7-NSP-1-QS-S-17D	87
Sc EHN04542	[RIN---ELAN-KFSAST-HLEHHTTALSCLTP-EGSKDDVVLF-1FDADGLSVR-NNHV-KICQJLSS-E-EMSS-1RNTE-DMHKLCKNHLDS-S-MNR	98
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Hs NP_002844	[-----PTT-ILKGE-C-OQGYGPML-FLEKGG-VV-V-CKINTQEPEE-PD-GCSTNVIN-K---III-QSGC-PAFSE-DMT---SEV-LOI-T-SPD	184
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Dm NP_477440	[-----CSLR-MYRD-CPQK-C-YPHDDD-VSTECAIKTMODCEP-PD-GCNLKD-PDLN-V-VIF-EGW-N-SKVFN-EKS---AEST-FVTS-SPN	179
Ce NP_499521	[-----SS---M-FQD-PMQFV-KMLVDA---GM-ARGNF-FTTLDQFLD-BEFDAGVLA-TYLM-QLV-101-Q-FDDT---SRTR-QFTK	175
Sp NP_594809	[-----GKERISTSANDQPT-NIMHKRGVICK-Q-NC-CCP-WEVEENACTACELT-TMECEEDD-D-101-RLASTLCT-K---II-NC-NWVDA-VE-DNNN-MGEN-1HSS	189
Sc EHN04542	[-----NSD---DIRECTS-CHGSPV-1FEDSF---ISERVEYS-1YIKD-FDINGLELERKISEFAIT-GEAHSN-1Q-KEIGCKCY-1YAKTEA	187
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Bd XP_003561137	[PSS-1FRGE-E-HGDLQIEFP-YA-D-111A-QD-H-[TSYAV-Y-KK-B-RAT-SN-FNPSIVKEN-NSK]-TIG-GCM-KIQ	266
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Dm NP_477440	[-----R-HPKITTV-C-TMAQVF-SV-EV-AKT-P-111A-QD-H-[TSVVA-Y-1SL-1-PSK-1-KVLSCKVSI-1B---SV-CP-PSL-1	250
Ce NP_499521	[-----S-ICFTTFD-V-GEETTV-S1PSR-L-1O-EV-SV-1L-E-[VEFS-111SL-1-QRM-TA-111ATKL111-1B---B-CP-PSL-1	243
Sp NP_594809	[-----QKSTP-1LRCVGALSTTB-E-1PNKSVL-E-1TS-1NTSY-1SL-1-PSK-1-KVLSCKVSI-1B---EN-CP-PSL-1	260
Sc EHN04542	[-----DEN-1PALIKSQLGFSSKIKLP-1RS-1EKLQVFDGDSTT1DGF-1PAVIGP-1TSFDKIRKSTKIAKSVL-1MDVHGVL-SVNILSQ-TDDVII-1DTTRP-1NN-1PS-1QI	295
Os BAB19377	[-----H-SV-1VARPGM-1ONFRN-VAG-1Q-PSR-1AY-1EFT-K-B-YEINDA-	304
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Dm NP_477440	[-----L-V-Q-1---DSC-1-EI-1-FIOFF-1---1LNNTD-	274
Ce NP_499521	[-----FS-1DH-1-G-1---E-NASY-111-LTV-1ADEEE-	267
Sp NP_594809	[-----1VQGEGLCTFV-1DFCIV-1PLDV-1SEDEKEEDEEE-1AS-SNQSD-1NNVLRND-PNYRGDAETEDEDS-	323
Sc EHN04542	[-----Q-1PDPYC-1IV-1EV-1CMLEK-1S1DEAAQ-1E-1LL-1ETN-1LGNNNS-1FKK-1TIRK-1YGTGKNETS-1NDNLL-1QLNGKK-1KL-1PSEE-1NNKN-1RESE-1DEENH-1CKYPTK-1D-1IFF	401

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- 4 Supplemental Figure S1. Multiple sequence alignment of OsRAD1 homologs. Os, *Oryza sativa*; Bd, *Brachypodium distachyon*; Sb, *Sorghum bicolor*; Zm, *Zea mays*; At, *Arabidopsis thaliana*; Gm, *Glycine max*; Hs, *Homo sapiens*; Mm, *Mus musculus*; Dm, *Drosophila melanogaster*; Ce, *Caenorhabditis elegans*; Sp, *Schizosaccharomyces pombe*; Sc, *Saccharomyces cerevisiae*.
8 Identical amino acids are shaded in black. Similar amino acids are shaded in gray.

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10 **Supplemental Figure S2.**



11 **Supplemental Figure S2.** Expression analysis of *OsRAD1* in leaf, young panicle, sheath, root and
12 seeding by Real-Time QPCR. The error bar represents the SE of mean values in three biological
13 replicates.

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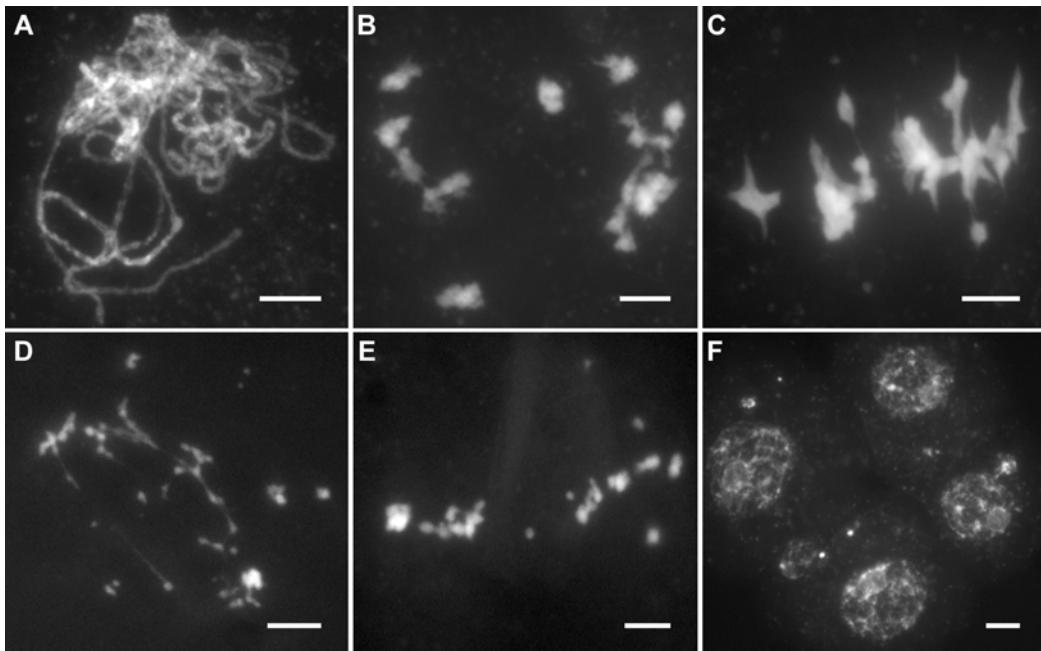
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23 **Supplemental Figure S3**

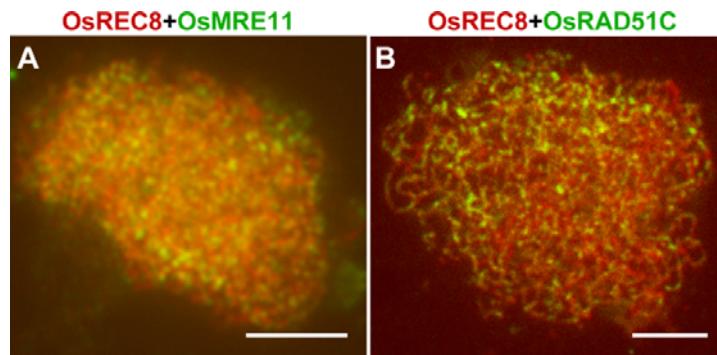


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25 **Supplemental Figure S3.** Meiotic defects in *Osrad1-2*. **(A)** Pachytene. **(B)** Diakinesis. **(C)**
26 Metaphase I. **(D)** Anaphase I. **(E)** Metaphase II. **(F)** Tetrad. Bars = 5 μ m.

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28 **Supplemental Figure S4**



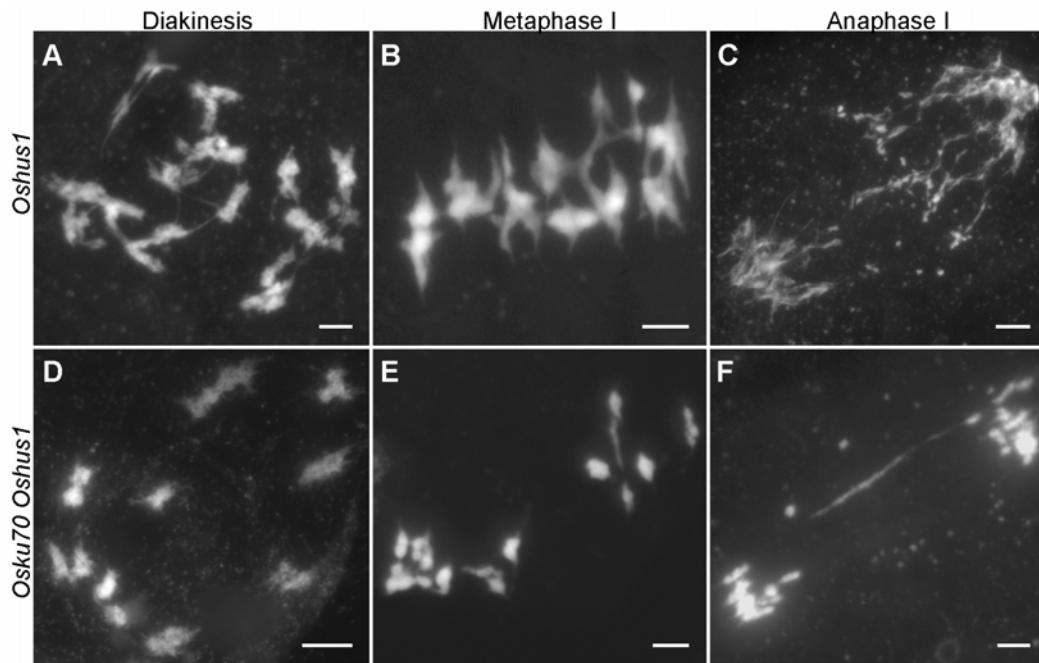
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30 **Supplemental Figure S4.** Localization of OsMRE11 and OsRAD51C in *Osrad1*. **(A)**
31 Immunostaining of the *Osrad1* mutant for OsREC8 and OsMRE11. **(B)** Immunostaining of the
32 *Osrad1* mutant for OsREC8 and OsRAD51C. Bars = 5 μ m.

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35 **Supplemental Figure S5**



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37 **Supplemental Figure S5.** Genetic analysis of *OsHUS1* with *OsKU70*. (A) to (C) *Oshus1*
38 mutation leads to ectopic chromosome associations during meiosis. (D) to (F) Loss of *OsKU70*
39 partially rescues the meiotic defects of *Oshus1*. Bars = 5 μ m.

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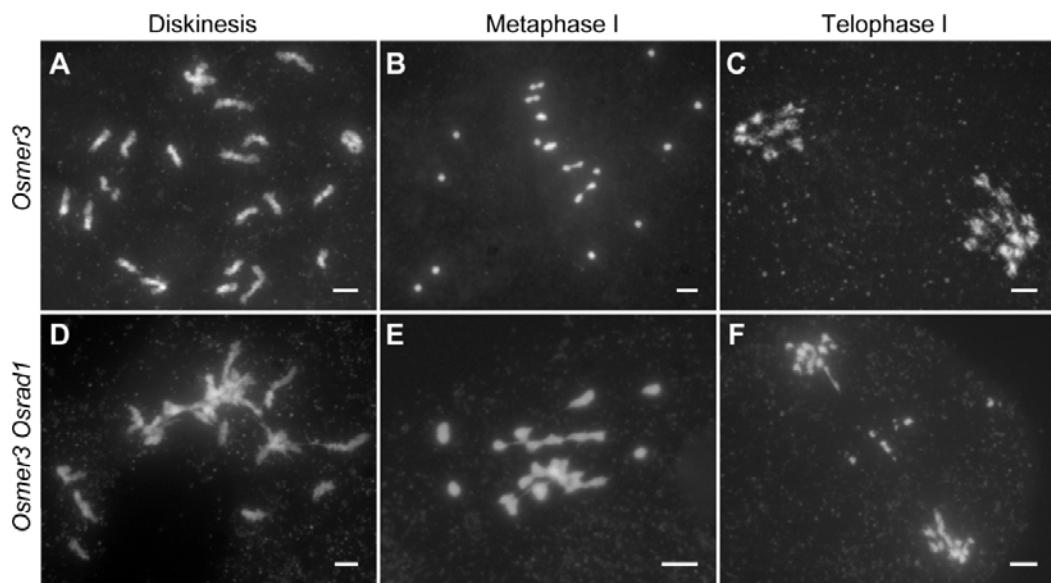
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50 **Supplemental Figure S6**



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52 **Supplemental Figure S6.** Chromosome behaviors in *Osmer3* and *Osmer3 Osrad1*. **(A)** to **(C)**
53 Meiotic chromosomes in *Osmer3*. **(D)** to **(F)** Ectopic chromosome associations occur in the
54 *Osmer3 Osrad1* double mutant. Bars = 5 μ m.

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57 **Supplemental Table S1. Markers used in Map-based Cloning**

Name	Primer	Sequence(5'-3')
M1	F	GTTGGCTTGGCTACTGATT
	R	CGGGGCACGCTTGAGTTGT
P1	F	GGCCTAGGGGCCTAAAGAAAAC
	R	GTCCACCTGTCCGTGCGTATCA
P2	F	CATTATTCTAGATATTGTG
	R	GTGATTCTCTCTGATCATC

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59 **Supplemental Table S2. Primers for RACE, RT -PCR, and Plasmid Construction**

Name	Sequence(5'-3')
Adaptor-T(18)	CTGATCTAGAGGTACCGGATCCTTTTTTTTTTTTTTTTT
R3-1	TCTTCGTGCAACAACTTCG
R3-2	CCAAACAGTATTGTGAAGG
RO-F	ATGAGCTCGTCGACGTCCGC
RO-R	CTACGCATCATTATCTCAT
RAD1RT-F	CAGGTTCCAGCATTCAAGATTC
RAD1RT-R	TGTTTCATGGTCACATTGGAATG
Actin-F	CTGACAGGATGAGCAAGGAG
Actin-R	GGCAATCCACATCTGCTGGA

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