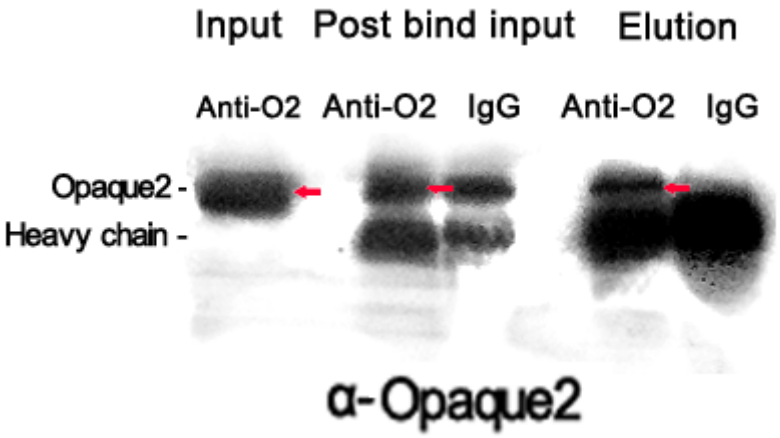
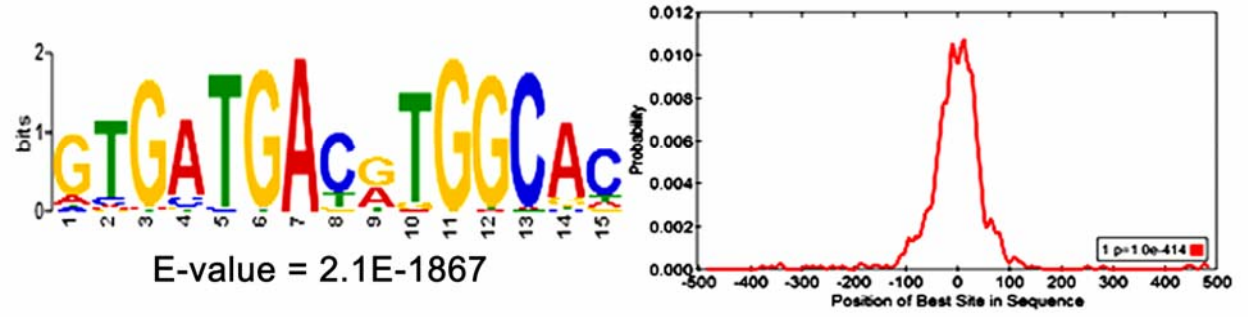
Supplemental Figure 1. Phenotype of mature wild type and *o2* kernels. The mature homozygous mutant kernels (*o2/o2*) and homozygous wild-type kernels (wild type/wild type) were randomly selected and viewed on a light box.



Supplemental Figure 2. Determination of the O2 antibody specificity in input sample, post bind input sample and elution sample of the ChIP experiment by immunoblot analyses. Arrows indicate O2-specific band.



Supplemental Figure 3. O2 binding motif identified by MEME-ChIP on 1kb flanking sequences around the intergenic peak summits and its density plot around the summits of peaks.

Supplemental Table 1. mRNA accumulation differences identified by RNA-Seq and qRT-PCR for 38 out of the 40 selected DEGs.

Gene	RNA-Seq WT/*o2* (log2)	P-value	qPCR WT/*o2* (log2)	P-value
GRMZM2G331701	-4.12	1.45E-04	-5.10	0.046
GRMZM2G061758	-5.67	2.15E-02	-2.29	0.0054
GRMZM2G026703	-5.14	9.90E-25	-4.65	0.011
GRMZM2G380656	-2.93	3.37E-303	-2.63	0.00069
GRMZM2G030717	-2.36	1.45E-13	-2.47	0.048
GRMZM2G112247	-1.70	2.44E-05	-1.85	0.016
GRMZM2G063536	4.52	3.15E-49	4.90	0.027
GRMZM2G066413	3.53	6.33E-03	4.07	0.035
AC208337.2_FG003	-18.56	3.75E-02	-1.83	0.037
GRMZM2G015534	7.63	8.59E-75	7.17	0.0088
GRMZM2G126083	2.81	3.10E-04	5.86	0.035
GRMZM2G181362	2.19	2.48E-17	1.83	0.069
GRMZM2G091201	2.76	2.42E-06	2.81	0.019
GRMZM2G170201	1.05	7.05E-08	1.26	0.0013
GRMZM2G015364	4.06	9.77E-04	1.95	0.026
GRMZM2G429533	3.26	4.02E-04	4.83	0.0022
GRMZM2G326116	2.26	5.44E-07	3.80	0.0024
GRMZM2G037411	-2.24	2.53E-05	-2.31	0.019
GRMZM2G038536	1.31	4.53E-03	1.26	0.040
GRMZM2G146490	-2.34	1.63E-06	-1.99	0.022
GRMZM2G540772	5.87	3.42E-03	1.57	0.042
GRMZM2G008607	2.03	1.07E-06	1.33	0.0094
GRMZM2G108523	1.43	8.59E-04	1.54	0.034
GRMZM2G117840	1.62	1.23E-35	1.26	0.013
GRMZM2G121029	1.39	6.15E-04	1.85	0.0035

GRMZM2G126083	2.81	3.10E-04	5.86	0.035
GRMZM2G128832	1.19	1.15E-07	2.29	0.0085
GRMZM2G129674	2.28	9.09E-04	2.96	0.0011
GRMZM2G131205	1.55	2.03E-04	1.44	0.018
GRMZM2G131888	4.03	5.62E-06	4.77	0.0091
GRMZM2G143008	1.49	1.20E-14	1.73	0.0018
GRMZM2G002173	-3.96	4.02E-04	-4.18	0.048
GRMZM2G029521	-1.94	7.53E-04	-2.92	0.012
GRMZM2G039588	-1.15	6.18E-07	-1.04	0.013
GRMZM2G103900	-2.58	6.71E-28	-3.76	0.073
GRMZM2G129399	-3.48	4.21E-09	-3.62	0.042
GRMZM2G134054	-2.31	3.02E-09	-2.28	0.011
GRMZM2G304548	-1.25	0.00E+00	-1.25	0.049
GRMZM5G836174	-3.59	4.65E-06	-3.72	0.025
GRMZM2G149647	-4.01	1.10E-11	-4.09	0.016

Supplemental Table 2. Probes for EMSA as specific sequences derived from potential O2 direct targets containing O2 binding sites.

***cis*-element**	**Probe sequence**
Z1	AAAGCACGTTTGCTAGAGAGATCTCACATGTGTTCACACGTACATAGATCTCGCGG
Z2	GCTATTAGGGACAGGGCCATACAACATGCATGATAACTTATTGAGTTTGGGTAAA
Z3	CATGTCATTCCACGTAGATGAAAAAATTCCTATATAAAAATGACACCTTTTCTTGT
B1	TAAATGTCAAAACCAACTAGATACCATGTCATCTCTACCTTATCTTACTAATGTTC
B2	GTAGAGTAGTAACAACCATCTTCCATATCATCAGTACTGACAGGTGAAGTCAATA
B3	TAAATGTCAAAGCCAACTAGATACCACATCATCTCTAGCTTATCTTACTAATATTC
B4	CATTAAGAGGTTGGATGTTAGTGGGATGACATGACTATTAGTAGGACGAGATGA
B5	CCCCTCCTGTCCTATAAAAAAAAGTTGACGTGAATAGATTTCATTAAGAGGTTGGA
B5-like-box	CAGAAAGTGCAATACAATACATGTTGACGTTGGTAAGGCATGGTGTCTAGCACAC
O2-like-box	TGTCAAGCTAAATCTAATTCGTTTTACGTAGATCAACAACCTGTAGAAGGCAACAA
O2 BS-1	CGTAGGGAAGCAAGCCCGTACGTGTTGATCTGAGGTGGCCGCGGGCGTCCGGATAT
O2 BS-2	CTTGTCATGTAGCCGTAGATGATGATGACGTGTGTTTTTTTTTGGCGGGAGAGGTC
C-box	GTGCCTACAATGAAGTGAAAGGTGATGAGTCATGGTGATGTGTAAAGAGGCATTAC
TGACGTGG	TGGTTTTGGAATGTTGCGTTGCATGACGTGGAAACATAGTACATGGATTTGGATTT
TGGCGTGGCA	TTTGGGCGTGAGAAGCTGGACTGTGGCGTGGCACCGGATAAGCGCACGCGTGGCCG
TGACATGTAA	AGCAAGAAAAGGACAATAATACTTGACATGTAAAGTGAAGCTTATTATACTTCCTA
TGTCGTGTCA	GCCGCTTCTGTGTGTGACTCACGCTGTCGTGTCAGCCGCACGCATGCGTGACGCGC

Supplemental Table 3. Primers used in these experiments.

	Primer name	Sequence
Real-time PCR	AC208337.2_FG003	AGCCAAGGGCATAAGAGATGGTG
		ACCACGTGTCATCCAGCCATTTG
	GRMZM2G331701	ATCGCGAAGACACACTGGGTAG
		AGAAACTCCACCCGATCAAAGCTG
	GRMZM2G061758	AGGCCAAAGGGTTTCTCTTCGTG
		TCTGACGGTGACGGAAATCGAG
	GRMZM2G026703	GACAAGAAGCCGACCCATTCCAAC
		TCATAGAACCGCGGGCGATGTTTG
	GRMZM2G380656	TTGCTCCTCCTGACCTTTGCTG
		TCCCTTTCTGTTCCTGGCTTCG
	GRMZM2G030717	ACCGCCGGTGTAGTGTAGTATC
		AGCGCAGAGTTCGTCCATCTTC
	GRMZM2G112247	TCCTCTTCAGCTCAGGGTTGTATG
		TGTGGGCCCAAACGTACTCAAG
	GRMZM2G063536	ACACTGCACCGACCATAAAGGG
		TAGAACCATAGCTCCGGGACCTTC
	GRMZM2G066413	GCTTCCATGGCTATCAGAAGCTC
		AGGAGACGATCACAACCACACG
	GRMZM2G015534	TCAAACAATCACACTGGAGGTAGC
		CCGTTCATCAGCTTGTTCTGCAC
	GRMZM2G126083	AGGTGCTACGTGCCAAACTTCG
		TCCCTCTGTTCTGTGGTTTCTCG
	GRMZM2G181362	CCTATGGCCACAATGAGCAAGAC
		AACCTTCCCGAACTCCAGTAGC
	GRMZM2G091201	ACAAAGCTAGCACCGAGATCCAG
		TGATCCCGTCTCGCAAAGGTAAAG
	GRMZM2G170201	CAACGCAGACAGTCCAAGATGG
		CACAACCGCACTACGAATGCTC
	GRMZM2G015364	AAGTACAGCCAGAAGCGTCGTC
		TCTCTTGCTCCTGATCGTAGTCG
	GRMZM2G429533	TAAGCTGCTCAATGCCCACAGC
		CGCCATTATATATCGCTGCGAGTC
	GRMZM2G326116	ATGGAGACGGCAATGTCAAAGC
		TGCGCGAGGATCATCAACAGAC
	GRMZM2G037411	CAGCCACATCACCTTCGAGAAC
		ACCTGTACAGCATGGTCTTGTCG
	GRMZM2G038536	GCCAGCAGCAAATGGTTCACTC
		ACTGTCTCGAAACCTGATGCTACG
	GRMZM2G146490	GGCCATGGATGATTTGGCACAG
		TCAGTTCACTTGGCTCTGGCTTC
	GRMZM2G540772	ACGAGGAGCAGATCCTGTGCTATC

		TCTTCTGCCGTGCGCTTATGTG
	GRMZM2G18076	AAGGCGGAGAGCCTAGAAGATG
		TGGAAGCACCATTGCCATACTTG
	GRMZM2G108523	GTCGTTTATGCAGCAGCGATCC
		ACGTTCTCACGCTCACAGAAAGG
	GRMZM2G117840	TGCCTACATGCTTTGGTTGGTG
		AGAGTCGGGTTTCCCGTTTACC
	GRMZM2G121029	ACAACATCCATGGGACCAACCG
		TTGACCGGAGAGGAGTTGGATCAG
	GRMZM2G126083	AGGTGCTACGTGCCAAACTTCG
		TCCCTCTGTTCTGTGGTTTCTCG
	GRMZM2G128832	TCTGCATTTGCAGCCAGTCGTC
		TGGATCGTCTGCATAGTCCGATTG
	GRMZM2G129674	ATGCCGACGGAGATGCAGATATGG
		ATCATCAGCTCAGGCACGATCCTC
	GRMZM2G131205	TGCTGCTCGAGAAGGGATACAC
		GTTCTTCGGGTCATCTGGGTTC
	GRMZM2G131888	ACATCCTCTGCCTGTGATTTCGTG
		ATAGTAGATCCTCCGCCGAAGC
	GRMZM2G143008	TTTCGTGACGATCGCCAAAGGG
		TCTTTATCGCTGCGCGGACTTC
	GRMZM2G002173	GCCTTCTGCGTATCCTTCAAGC
		TTGGCCACAACAACGTCCATCC
	GRMZM2G029521	GCCCATCTCCTCCTCTCTCAATTC
		AACGGTTGGAGAATCGCACCAC
	GRMZM2G039588	CCAATATGCTTTCCGCAGTTCTCC
		CCTTGCAAATCCATGTGGTTCCAG
	GRMZM2G103900	AGCAGCTTAGTTCATGTTCCTGTC
		TCCATACGATGTGAAACCTTCTGC
	GRMZM2G129399	AAGATCGAGGCGCAGTATGTGG
		ATCTTCTTCTCGCAGCCGTAGG
	GRMZM2G134054	GCATCCACTTCGTCATGCTTGC
		TTGTACTGCGCACCTGATCTGC
	GRMZM2G304548	TCTCGGATCGTTCATCCGGAAC
		TCTCATGCACGTTGGGAGATCAG
	GRMZM5G836174	CCATCGATCCAGTGCAAACAAGC
		TGCTTCGTGTGGTAGACCGTAG
	GRMZM2G149647	GGACAACAGTGTCGACGTACAG
		ACATCGGATCAACTAACCCGAACG
ChIP qPCR	19 kD α-zein z1A	GGACAATAACGAGAGGAAAAACCA
		ATCAGTCCTTGTGCTTGTGC
	19 kD α-zein z1B	GGTCACTAAATGTCAAAGCCAACT
		ACACATGTTAGACCTTGTGCTT

	19 kD α-zein z1D	TGTGTCATACCACTTGCCCT
		ACAAGTGCAACCCTTAGCCA
	22 kD α-zein	AGATCATGCATGTCATTCCACG
		TCCACTACCTACAAGAAAAGGTGT
	14 kD β-zein	GTGGATCCAAGGCATCCTAACA
		CGCTTGTGAAGCTAACTTTGT
	27 kD γ-zein	AGGCCGGACAGGACAAAAAT
		GTACTTCTGCGTGGCTCAGT
	50 kD γ-zein	TTCATACAAAGCAAGAAAAGGACA
		GTGGATTTTTGGACCTTTGTGC
	10 kD δ-zein	ACAAGTCCAAGTATTAAGTATCCGA
		AGCATGACAAATATCGGAACGG
	cyPPDK1	TTCGAAGGCATTTTCCGTGC
		GGGAGTCCTGAAACGCAAGA
	ZmUBQ	GACGAGTCTAACGGACACCA
		ATTTCTGGATGCCGACAGCG
	b-32	AGGACGAGATGATGTGGAAAGT
		GCATGCAGCCATGTTGGTAG
Vector construction	LGL GRMZM2G312877	CGGTCGACTATGTCCGAATCCATATATAGGCTT
		CCCAAGCTTCCTCCTGCAGCGCTGTTAATTCCGA
	LGL GRMZM2G028110	GCGTCGACGTCCCTAAAATATTAAATGATAATA
		ATCCCGGGCCTCCTCGATGATCTTCTGTGTAGC
	p19 kD z1A	GCAAGCTTACTTCTAAGAATTTGGTATGCCAGT
		GCGCGGCCGCTCACTCGATCCCCACCGATA
	p19 kD z1B	GCAAGCTTTTCTAGGGTACCAGGCCTCC
		GCGCGGCCGCTGCAGAAAGAGCAAGGAGCA
	p19 kD z1D	GCAAGCTTATCAACTCTTGTTCATCATT
		GCGCGGCCGCTGGTGCTAAGATGTTGCTAG
	p 22 kD	GCAAGCTTTCCGGTATGCACTGAAAGCA
		GCGCGGCCGCGCTCAAAATATTATGGGTGATGGTT
	p 14 kD	GCAAGCTTTGCTGCCCTGCTGGAATAAA
		GCGCGGCCGCTAACGCTTAGACCACTGGAAGC
	p 27 kD	GCCTCGAGTCTCTGTGTGCAAAGAAACA
		GCGCGGCCGCCGGGTTCTTCTGCGCTCTGG
	p 50 kD	GCGTCGACTTGAGAGCAATGGTATGCAAATCCT
		CGGGATCCGGTTTTTGGAGTTAGATAATTGATG
	p 10 kD	GCGTCGACCCGTATAAGAGGGCTAAGATCTAAT
		CGGGATCCGGCGGTGGTGTCCTTGCTTCCTAGA
	p MYB	CCCAAGCTTAACCAGTGGGGCAACCACAAGTCAAACC
		CGGGATCCTGCTGCGCGCGTTCCCTGACGGTGACGG
	p GBF1	GCGTCGACCCTCGCGGTCTCTCTCTCCTTCCTGATT
		CGGGATCCGACAGTATCTGCTAGTCTGTCATGTAAA
	p NFYB	CCCAAGCTTCTTTCACTATGTGTCAAGTCACCTCTCA

		CGGGATCCCGCGGCCGAGCCACCGAACAGCACTGTC
	p cyPPDK1	CCCAAGCTTTATGCATCACGCATGGAACAAGAGG
		CGGGATCCTAGCACAGGGAAACAGCGCTAGCTA
	p cyPPDK2	GCGTCGACACTGATACGATCGACGAATAAAAAA
		CGGGATCCTAGCACGGCAAAGCAAAGCAAACAA
	Opaque-2	GCCCCGGGATGGAGCACGTCATCTCAAT
		GCGAATTCCTAATACATGTCCATGTGTA