

Supplemental Table 1. List of the simple sequence repeat (SSR) and single nucleotide polymorphic (SNP) markers used in the genetic cluster analysis. The markers are listed with the associated wheat chromosome.

SSR	Chr	SNP	Chr§
barc287	1A	IWA1562	2A
barc1048	1A	IWA1960	2A
barc061	1B	IWA2526	2A
barc081	1B	IWA3151	2A
barc302	1B	IWA3576	2A
barc271	1D	IWA3743	2A
barc1090	1D	IWA4491	2A
barc208	2A	IWA5068	2A
barc212	2A	IWA6839	2A
barc1024	2B	IWA7166	2A
barc168	2D	IWA1348	2B
barc019	3A	IWA1707	2B
barc1060	3A	IWA2391	2B
barc1077	3B	IWA2766	2B
barc042	3D	IWA2988	2B
barc1047	4A	IWA4472	2B
barc1052	4A	IWA4953	2B
barc1045	4B	IWA5081	2B
barc1133	4B	IWA5818	2B
barc048	4D	IWA6164	2B
barc217	4D	IWA7633	2B
barc1118	4D	IWA7697	2B
barc056	5A	IWA8270	2B
barc1182	5A	IWA8534	2B
barc074	5B	IWA2160	2D
barc088	5B	IWA8365	2D
barc044	5D		
barc037	6A		
barc1055	6A		
barc175	6D		
barc1030	6D		
barc064	7A		
barc1084	7A		
barc065	7B		

barc072 7B
 barc1073 7B
 barc126 7D

§Designated from 9K consensus
 map, TCAP project

Supplemental Table 2. The primer sequences for the bread wheat associated Vrn-1 locus and photoperiod markers. The annealing temperatures used for PCR and the expected band sizes for each locus is listed. The marker results from the Iranian landrace subset were used for the phenotypic cluster analysis.

Locus	Sequence (5'-3')	TA	Size	Citation
VrnA1a/b	F: GAAAGGAAAAATTCTGCTCG R: GCAGGAAATCGAAATCGAAG	50	965+876 714	Yan et al., 2004
vrnA1	F: GAAAGGAAAAATTCTGCTCG R: GCAGGAAATCGAAATCGAAG	50	734	Yan et al., 2004
VrnB1	F: CAAGTGGAACGGTTAGGACA R: CTCATGCCAAAAATTGAAGATGA	63	709	Fu et al., 2005
vrnB1	F: CAAGTGGAACGGTTAGGACA R: CAAATGAAAAGGAATGAGAGCA	58	1149	Fu et al., 2005
VrnD1	F: GTTGTCTGCCTCATCAAATCC R: GGTCACCTGGTGGTCTGTGC	65	1671	Fu et al., 2005
vrnD1	F: GTTGTCTGCCTCATCAAATCC R: AAATGAAAAGGAACGAGAGCG	63	997	Fu et al., 2005
PpD-D1	F: ACGCCTCCCACTACACTG R1: TGTTGGTTCAAACAGAGAGC R2: CACTGGTGGTAGCTGAGATT	52	288/414	Beales et al., 2007

Vrn = vernalization loci in corresponding genome

PpD = photoperiod loci in corresponding genome

TA = annealing temperature for the forward (F) and reverse (R) primer sets listed

Size = expected band size for each allele on 2% agarose gel

Supplemental Table 3. Type 3 Effects from the mixed model analysis of the agronomic traits Days to Heading, Grain Volume Weight, and plant Height across years (2012 and 2014) and locations (Pullman and Pendleton).

Type 3 Tests of Fixed Effects			
Days to Heading	Grain Volume Weight	Height	

Effect	DF	F Value	Pr > F	DF	F Value	Pr > F	DF	F Value	Pr > F
Entry	76	3.78	<.0001	76	6.71	<.0001	76	3.79E+13	<.0001
Location	1	16.16	<.0001	1	221.70	<.0001	1	6.83E+15	<.0001
Year(Location)	1	275.03	<.0001	1	159.42	<.0001	1	0.00	1.0000
Entry*Location	75	1.31	0.1313	67	5.72	<.0001	72	2.85E+13	<.0001

Supplemental Table 4. A list of traits scored by eye from the Iranian landrace subset collected from Spillman Agricultural Farm and the Columbia Basin Agricultural Research Center at Pendleton. The traits were recorded in 2012 and 2014 at the Spillman location and 2014 for the Pendleton location in headrow plots.

Accession	Growth Habit	Seed Color	Pubesence	Awns
IWA8604094	Spring	white	Yes	Yes
IWA8604259	Spring	red	no	Yes
IWA8604272	Spring	white	Yes	Yes
IWA8604394	Spring	white	Yes	Yes
IWA8604409	Spring	white	no	Yes
IWA8604568	Spring	white	no	no
IWA8604571	Spring	red	Yes	Yes
IWA8604686	Spring	red	Yes	Yes
IWA8604710	Spring	white	no	no
IWA8604716	Spring	white	Yes	no
IWA8604740	Spring	red	no	Yes
IWA8604765	Spring	white	no	no
IWA8604782	Spring	white	Yes	Yes
IWA8604794	Spring	red	Yes	Yes
IWA8604807	Winter	white	no	Yes
IWA8604895	Spring	white	no	Yes
IWA8606031	Spring	white	no	Yes
IWA8606074	Spring	red	no	Yes
IWA8606081	Spring	red	Yes	Yes
IWA8606083	Spring	red	Yes	Yes
IWA8606091	Spring	red	Yes	Yes
IWA8606134	Spring	red	Yes	Yes
IWA8606188	Spring	red	no	Yes
IWA8606229	Spring	red	no	Yes
IWA8606267	Spring	red	no	Yes

IWA8606270	Spring	red	no	Yes
IWA8607438	Spring	white	no	Yes
IWA8607542	Spring	red	Yes	Yes
IWA8607547	Spring	white	no	Yes
IWA8607575	Spring	white	no	Yes
IWA8607576	Spring	red	no	Yes
IWA8607766	Spring	white	no	Yes
IWA8607776	Spring	white	no	Yes
IWA8607818	Spring	red	no	Yes
IWA8607820	Spring	white	no	Yes
IWA8607866	Spring	red	no	no
IWA8607871	Spring	red	no	Yes
IWA8607923	Spring	red	Yes	Yes
IWA8607958	Spring	red	Yes	Yes
IWA8607960	Spring	red	no	Yes
IWA8607961	Spring	red	Yes	Yes
IWA8607962	Spring	red	Yes	Yes
IWA8607963	Spring	red	Yes	Yes
IWA8607995	Spring	white	no	no
IWA8608010	Spring	white	no	Yes
IWA8608014	Spring	white	no	Yes
IWA8608064	Spring	red	no	Yes
IWA8608074	Spring	red	no	Yes
IWA8608077	Spring	white	Yes	Yes
IWA8608080	Spring	white	Yes	Yes
IWA8608082	Spring	red	no	Yes
IWA8608147	Spring	red	no	Yes
IWA8608152	Spring	white	Yes	Yes
IWA8608177	Spring	red	Yes	Yes
IWA8608767	Spring	red	Yes	Yes
IWA8608802	Spring	white	Yes	Yes
IWA8608819	Spring	white	no	Yes
IWA8608830	Spring	white	no	Yes
IWA8608846	Spring	white	no	Yes
IWA8608909	Spring	white	no	Yes
IWA8608911	Spring	white	no	Yes
IWA8608915	Spring	white	Yes	Yes
IWA8608928	Spring	red	no	Yes
IWA8608938	Spring	white	no	Yes
IWA8608982	Spring	red	Yes	Yes
IWA8608983	Spring	red	Yes	Yes
IWA8608990	Spring	red	no	Yes
IWA8608992	Spring	white	no	Yes

IWA8609012	Spring	white	no	Yes
IWA8609023	Spring	white	no	Yes
IWA8609031	Spring	white	no	Yes
IWA8609035	Spring	red	no	Yes
IWA8609036	Spring	red	Yes	Yes
IWA8609045	Spring	red	Yes	Yes
IWA8609049	Spring	red	Yes	Yes
IWA8609061	Spring	white	no	Yes
IWA8609064	Spring	red	no	Yes
IWA8609076	Spring	red	Yes	Yes

Supplemental Table 5. Evaluation of accessions for threshing ability. Dirty and clean grain volume weights were compared from the 2012 field trial at the Spillman agricultural research farm. The least squared means (lsmeans) were determined across the two headrow replicates with a Dunnetts comparison.

Accession	lsmeans	<i>p-value</i>	Call
IWA8604094	2.35	0.085	Reduced
IWA8604259	0.30	0.824	Free
IWA8604272	1.35	0.318	Moderate
IWA8604394	2.35	0.085	Reduced
IWA8604409	2.40	0.078	Reduced
IWA8604568	2.50	0.067	Reduced
IWA8604571	1.00	0.459	Moderate
IWA8604686	n/a	n/a	n/a
IWA8604710	0.75	0.578	Free
IWA8604716	2.00	0.141	Moderate
IWA8604740	2.00	0.141	Moderate
IWA8604765	5.95	0.000	Reduced
IWA8604782	0.10	0.941	Free
IWA8604794	3.20	0.020	Reduced
IWA8604807	n/a	n/a	n/a
IWA8604895	0.20	0.882	Free
IWA8606031	3.10	0.024	Reduced
IWA8606074	0.55	0.683	Free
IWA8606081	1.30	0.336	Moderate
IWA8606083	1.65	0.223	Moderate

IWA8606091	n/a	n/a	n/a
IWA8606134	0.70	0.604	Free
IWA8606188	0.60	0.656	Free
IWA8606229	0.35	†	Free
IWA8606267	1.20	0.375	Moderate
IWA8606270	0.45	0.739	Free
IWA8607438	0.60	0.656	Free
IWA8607542	0.95	0.482	Free
IWA8607547	0.30	0.824	Free
IWA8607575	0.90	0.505	Free
IWA8607576	1.85	0.173	Moderate
IWA8607766	0.05	0.970	Free
IWA8607776	2.30	0.091	Reduced
IWA8607818	4.65	0.006	Reduced
IWA8607820	n/a	n/a	n/a
IWA8607866	0.40	0.767	Free
IWA8607871	1.45	0.284	Moderate
IWA8607923	1.25	0.355	Moderate
IWA8607958	0.85	0.529	Free
IWA8607960	1.10	0.416	Moderate
IWA8607961	0.80	0.553	Free
IWA8607962	0.65	0.630	Free
IWA8607963	1.35	0.318	Moderate
IWA8607995	0.20	0.882	Free
IWA8608010	1.90	0.162	Moderate
IWA8608014	0.50	0.711	Free
IWA8608064	0.40	0.767	Free
IWA8608074	1.45	0.382	Moderate
IWA8608077	1.25	0.451	Moderate
IWA8608080	1.95	0.151	Moderate
IWA8608082	0.75	0.578	Free
IWA8608147	0.40	0.767	Free
IWA8608152	1.05	0.437	Moderate
IWA8608177	0.65	0.630	Free
IWA8608767	0.90	0.505	Free
IWA8608802	0.55	0.683	Free
IWA8608819	1.10	0.416	Moderate
IWA8608830	0.10	0.941	Free
IWA8608846	1.50	0.268	Moderate
IWA8608909	1.45	0.284	Moderate
IWA8608911	1.90	0.162	Moderate
IWA8608915	2.25	0.098	Reduced
IWA8608928	0.25	0.853	Free

IWA8608938	0.45	0.739	Free
IWA8608982	2.30	0.091	Reduced
IWA8608983	0.45	0.739	Free
IWA8608990	0.20	0.882	Free
IWA8608992	0.00	1.000	Free
IWA8609012	0.25	0.853	Free
IWA8609023	0.00	1.000	Free
IWA8609031	2.35	0.085	Reduced
IWA8609035	0.35	0.795	Free
IWA8609036	n/a	n/a	n/a
IWA8609045	1.15	0.395	Moderate
IWA8609049	0.95	0.482	Free
IWA8609061	0.20	0.882	Free
IWA8609064	0.90	0.505	Free
IWA8609076	0.15	0.911	Free

† Control for Dunnett's comparison

Free= free threshing

Reduced= reduced thresh-ability

Moderate= moderate thresh-ability

n/a= not available

Supplemental Table 6. The accessions grouped by cluster from the Ward cluster analysis using the SSR, SNP, and Vrn marker data.

Origin	Accession	Vrn 1	Cluster
Markazi	IWA8604094	B	1
Kordestan	IWA8604259	B	1
Markazi	IWA8604272	A	1
E. Azerbaijan†	IWA8604394	A,B	1
Markazi	IWA8604409	A	1
Khorasan	IWA8604686	A,B,D	1
Khorasan	IWA8604794	A,D	1
Yazd	IWA8604807	none	1
Bakhtaran	IWA8606074	A	1
Ilam	IWA8606081	B	1
Ilam	IWA8606083	D	1
Bakhtaran	IWA8606091	B	1
Ilam	IWA8606134	B	1
Bakhtaran	IWA8607438	A	1
Bakhtaran	IWA8607575	A	1
Bakhtaran	IWA8607818	A	1

Bakhtaran	IWA8607866	A,B	1
Hamadan	IWA8607961	A,B	1
Kordestan	IWA8608177	none	1
Bakhtaran	IWA8608830	D	1
Bakhtaran	IWA8608846	A,B	1
Bakhtaran	IWA8608938	A	1
Ilam	IWA8608983	A	1
Ilam	IWA8609036	B	1
Ilam	IWA8609045	B	1
Esfahan	IWA8604568	none	1
Esfahan	IWA8604716	A	1
Khorasan	IWA8604765	none	1
Zanjan	IWA8604782	A	1
Khorasan	IWA8604895	A	1
Hamadan	IWA8607963	B	1
Ilam	IWA8608982	A	1
Ilam	IWA8608992	A,B	1
Ilam	IWA8609012	A	1
Ilam	IWA8609023	none	1
Esfahan	IWA8604710	D	2
W. Azerbaijan†	IWA8606188	B	2
W. Azerbaijan	IWA8606229	B	2
W. Azerbaijan	IWA8606267	B	2
Bakhtaran	IWA8607542	B	2
Bakhtaran	IWA8607871	A,B	2
Ilam	IWA8607958	A,B	2
Ilam	IWA8607960	A,B	2
Bakhtaran	IWA8607995	B	2
E. Azerbaijan	IWA8608064	B	2
E. Azerbaijan	IWA8608080	A	2
Bakhtaran	IWA8608802	B	2
Bakhtaran	IWA8608911	B, D	2
Ilam	IWA8609031	B	2
Kordestan	IWA8609049	D	2
Kordestan	IWA8609061	B	2
Bakhtaran	IWA8604571	B	2
Hamadan	IWA8606031	D	2
W. Azerbaijan	IWA8606270	B	2
Bakhtaran	IWA8607547	B	2
Hamadan	IWA8607766	A,B,D	2
Kordestan	IWA8607820	A	2
Bakhtaran	IWA8607923	B	2
Hamadan	IWA8607962	A,B	2

Kordestan	IWA8608147	D	2
Kordestan	IWA8608767	B	2
Ilam	IWA8609035	A,B,D	2
Kordestan	IWA8609064	B, D	2
Kerman	IWA8604740	A	3
Bakhtaran	IWA8607576	A,B,D	3
Hamadan	IWA8607776	A	3
Bakhtaran	IWA8608010	B	3
Bakhtaran	IWA8608014	B	3
E. Azerbaijan	IWA8608074	B	3
E. Azerbaijan	IWA8608077	D	3
E. Azerbaijan	IWA8608082	A	3
Kordestan	IWA8608152	B	3
Bakhtaran	IWA8608819	A	3
Bakhtaran	IWA8608909	B	3
Bakhtaran	IWA8608915	A,B	3
Bakhtaran	IWA8608928	A,B,D	3
Ilam	IWA8608990	A,B	3
Kordestan	IWA8609076	D	3

† East Azerbaijan

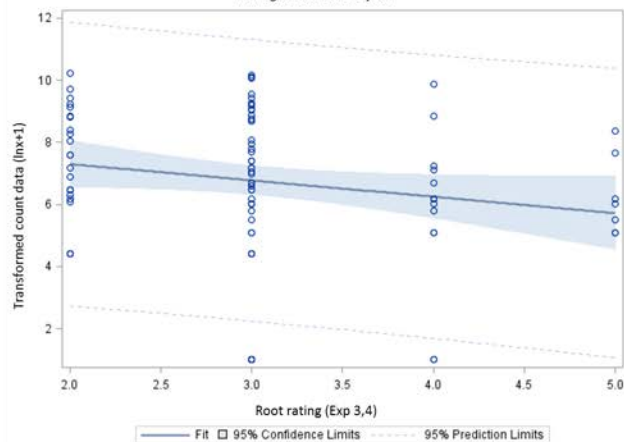
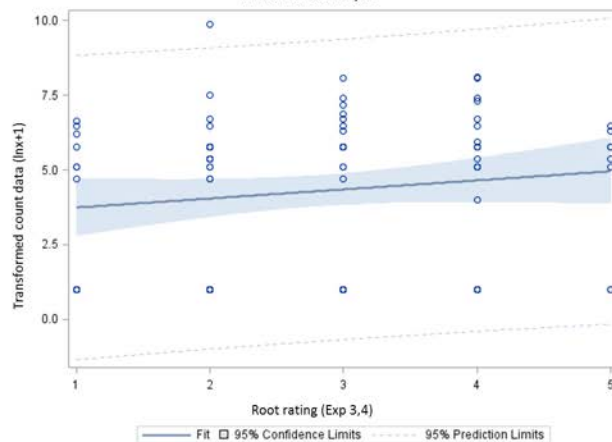
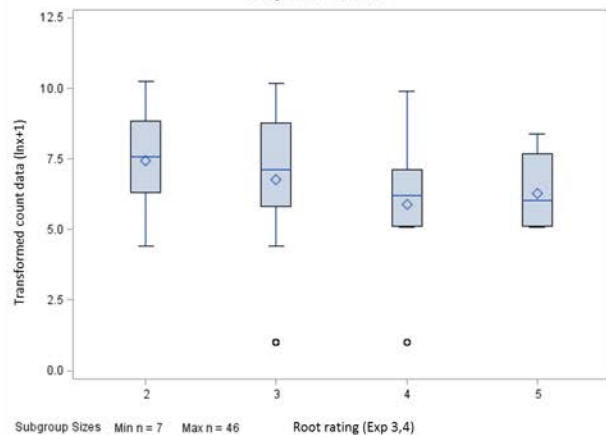
‡ West Azerbaijan

Supplemental Table 7. Lists the number of SSR markers assessed for each wheat genome. The corresponding number of polymorphisms scored within each genome across the markers are given along with the number of rare polymorphisms.

Genome	Markers assessed	Polymorphisms		
		Total	Rare	Percent rare
A	14	59	18	9.7
B	12	66	31	16.7
D	11	61	28	15.1
Total	37	186	77	41.4

Supplemental Figure 1. Scatterplots (top) and box plots (bottom) showing the distribution of the transformed count data ($\ln x + 1$) across the root ratings generated in experiments three and four.

The *P. neglectus* plots are on the left and *P. thornei* on the right.

P. neglectus scatterplot*P. thornei* scatterplot*P. neglectus* box chart*P. thornei* box chart