

Supplemental materials

*Article title:* QTL mapping for drought-responsive agronomic traits associated with physiology, phenology and yield in an Andean intra-gene pool common bean population

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**Table S1.** QTLs for leaf water potential (Wp), effective quantum yield of PSII ( $\Phi$ PSII), days to flowering (Df), days to pod-setting (Dp), number of pods per plant (Pp), number of seeds per pod (Sp) seed yield per plant (Syp), 100 seed weight (Hsm) and pod harvest index (Phi) in two seasons for drought and control for the common bean RIL mapping population.

Trait	QTL <sup>1</sup>	Treatment <sup>2</sup>	Year	LG	Position	Left Marker	Right Marker	LOD	LOD threshold	Add <sup>3</sup>	R2	
Wp	Wp6.1	Control	2013	6	13.1	BMb519	BMb341	4.0	1.6	-0.0	0.16	
	Wp5.2	Control	2014	5	43.6	AGTC02	BMd53	6.0	1.5	0.1	0.27	
	Wp10.1	Moderate	2013	10	25.3	PvM3	PvM2	3.2	1.7	0.7	0.13	
	Wp1.1	Moderate	2014	1	20.0	AGTA05	BMb356	1.6	1.6	-0.6	0.25	
	Wp1.2	Moderate	2014	1	98.5	BMb83	BM53	4.8	1.6	-0.6	0.25	
	Wp1.3	Moderate	2014	1	148.5	PVBR107	PvM120	2.4	1.6	0.4	0.10	
	Wp5.1	Moderate	2014	5	5.3	BMb250	PVBR93	2.4	1.4	-0.4	0.13	
	Wp6.2	Severe	2013	6	30.2	GCAT02	BM187	2.3	1.4	-1.8	0.10	
	Wp8.1	Severe	2013	8	56.8	BMc121	BMd25	1.7	1.5	1.9	0.11	
	Wp9.1	Severe	2013	9	0.0	BM141	BM202	2.1	1.8	-1.8	0.10	
	Wp1.2	Severe	2014	1	98.5	BMb83	BM53	2.8	1.6	-0.3	0.12	
	Wp3.1	Severe	2014	3	50.7	BMb339	BM181	2.2	1.3	0.2	0.08	
	Wp7.1	Severe	2014	7	36.7	BMb567	BM160	2.2	1.5	-0.2	0.09	
	$\Phi$ PSII	$\Phi$ PSII4.1	Control	2014	4	43.4	CAAT03	HRG	4.2	1.9	-0.0	0.20
		$\Phi$ PSII5.1	Moderate	2014	5	32.4	BMb611	BM175	3.46	1.4	0.1	0.16
$\Phi$ PSII9.1		Moderate	2014	9	7.0	BM141	BM202	2.83	1.7	0.1	0.19	
$\Phi$ PSII3.1		Severe	2013	3	50.7	BMb339	BM181	2.41	1.3	0.1	0.08	
$\Phi$ PSII7.1		Severe	2013	7	96.7	BMb502	BM150	3.75	1.6	-0.1	0.15	
$\Phi$ PSII11.1		Severe	2013	11	0.0	BMd22	BM239	4.55	1.6	0.1	0.16	
Df	<b>Df1.1</b>		2013	1	79.7	ATA3	BMb1024	7.0	1.7	-1.3	0.26	
	<i>Df1.1</i>		2014	1	79.7	ATA3	BMb1024	9.4	1.8	-0.9	0.34	
	<i>Df1.2</i>		2014	1	85.1	BMb1024	BMb83	7.8	1.8	-0.9	0.37	
Dp	Dp4.1		2013	4	122.4	AAGT10	ATA113	2.3	1.9	-0.8	0.14	
	Dp5.1		2013	5	33.4	BM175	AGTC02	1.8	1.5	0.6	0.07	
	Dp1.1		2014	1	81.1	ATA3	BMb1024	6.1	1.7	-0.8	0.23	
	Dp2.1		2014	2	35.0	BM237	ACGA02	2.3	2.0	-0.6	0.13	
	Dp4.2		2014	4	186	CCTA05	ACGT07	2.4	1.8	0.5	0.09	
	Dp6.1		2014	6	30.1	GCAT02	BM187	2.5	1.4	0.5	0.08	
	Dp6.1		2014	6	30.2	BM187	BMc238	2.7	1.4	-0.3	0.11	
Pp	Pp11.1		2014	11	55.4	ATA32	BMb619	2.6	1.4	0.4	0.11	
	<b>Sp2.1</b>		2013	2	85.2	BM236	BM156	4.0	1.9	0.2	0.15	
Sp	Sp7.1		2013	7	69.6	BMg1526	BMb502	2.9	1.8	0.3	0.29	
	<b>Sp2.1</b>		2014	2	85.2	BM236	BM156	3.1	1.9	0.2	0.11	
	Sp7.2		2014	7	43.2	BM160	BMg1526	3.7	1.6	0.2	0.14	
	Sp8.1		2014	8	38.3	AGGA05	BM211	3.6	1.6	0.2	0.13	
	Syp	Syp1.1		2013	1	78.4	BM356	ATA3	11.2	4.6	0.1	0.34
	Syp1.2		2013	1	86.1	BMb1024	BMb83	10.4	4.6	0.1	0.40	
Hsm	Hsm1.1		2013	1	9.0	AGTA05	BMb356	3.2	1.6	-3.6	0.24	
	Hsm2.1		2013	2	44.7	BM237	ACGA02	1.8	1.8	-2.1	0.08	
	Hsm2.2		2013	2	56.0	BM142	PVBR25	3.1	1.8	-3.3	0.19	
Phi	Phi3.1		2013	3	50.0	BMb339	BM181	2.9	1.2	6.1	0.13	
	Phi5.1		2013	5	44.6	BMd53	SSR-IAC88	4.2	1.4	-6.3	0.18	
	Phi5.2		2014	5	17.3	BMb250	PVBR93	1.7	1.4	-3.8	0.10	
	Phi5.3		2014	5	31.4	PVBR93	BMb611	2.5	1.4	-3.6	0.10	
	Phi7.1		2014	7	0.0	BMb160	BMb567	2.5	1.3	-3.6	0.09	
	Phi9.1		2014	9	23.0	BM141	BM202	4.7	1.5	-5.6	0.23	

<sup>1</sup> QTL detected in both seasons are marked bold, and those detected in more treatments of a single season are marked italic. <sup>2</sup> Moderate: moderate drought vs. control; Severe: severe drought vs. control. <sup>3</sup> The sources of additivity are 'Tiber' (+value) and 'Starozagorski' (-value).

**Table S2.** Identification numbers used in our study for previously reported *Phaseolus vulgaris* QTLs with known positions on the consensus linkage map (Galeano et al. 2011).

Datafile with QTL information »PvConsensus\_GaleanoFernandez2011\_a.txt« and appropriate annotation was obtained from the Legume Information System website (<https://legumeinfo.org/filebrowser/download/83>).

ID	Trait class	QTL name	LG	QTL symbol In publication	Trait name in publication	Citation
1	development	First flower, bean 2-1	Pv01	df1.1	Days to flowering	Blair, Iriarte et al., 2006
2	development	First flower, bean 3-1	Pv01	DF1	Days to flowering	Perez-Vega, Paneda et al., 2010
3	development	Full maturity, bean 3-1	Pv01	DM1	Days to maturity	Perez-Vega, Paneda et al., 2010
4	development	Last flower 1-1	Pv01	DE1	Days to end of flowering	Perez-Vega, Paneda et al., 2010
5	development	Full maturity, bean 1-5	Pv02	Dm2.1	Days to maturity	Blair, Galeano et al., 2012
6	development	Full maturity, bean 3-4	Pv02	DM2.1	Days to maturity	Perez-Vega, Paneda et al., 2010
7	development	Pod, green harvest 1-1	Pv02	DG2.1	Days to harvest as green pod	Perez-Vega, Paneda et al., 2010
8	development	Pod, green harvest 1-4	Pv02	DG2.2	Days to harvest as green pod	Perez-Vega, Paneda et al., 2010
9	development	First flower, bean 3-4	Pv02	DF2	Days to flowering	Perez-Vega, Paneda et al., 2010
10	development	First flower, bean 2-2	Pv02	df2.1	Days to flowering	Blair, Iriarte et al., 2006
11	development	Last flower 1-5	Pv02	DE2	Days to end of flowering	Perez-Vega, Paneda et al., 2010
12	development	Full maturity, bean 3-7	Pv02	DM2.2	Days to maturity	Perez-Vega, Paneda et al., 2010
13	development	Full maturity, bean 1-7	Pv02	Dm2.2	Days to maturity	Blair, Galeano et al., 2012
14	development	First flower, bean 1-2	Pv04	Df4.2	Days to flowering	Blair, Galeano et al., 2012
15	development	First flower, bean 1-8	Pv04	Df4.3	Days to flowering	Blair, Galeano et al., 2012
16	development	First flower, bean 1-1	Pv04	Df4.1	Days to flowering	Blair, Galeano et al., 2012
17	development	Full maturity, bean 1-4	Pv05	Dm5.1	Days to maturity	Blair, Galeano et al., 2012
18	development	First flower, bean 1-9	Pv05	Df5.3	Days to flowering	Blair, Galeano et al., 2012
19	development	First flower, bean 1-4	Pv05	Df5.1	Days to flowering	Blair, Galeano et al., 2012
20	development	First flower, bean 1-6	Pv05	Df5.2	Days to flowering	Blair, Galeano et al., 2012
21	development	Full maturity, bean 2-1	Pv05	dm5.1	Days to maturity	Blair, Iriarte et al., 2006
22	development	Last flower 1-12	Pv06	DE6.2	Days to end of flowering	Perez-Vega, Paneda et al., 2010
23	development	Full maturity, bean 3-13	Pv06	DM6.2	Days to maturity	Perez-Vega, Paneda et al., 2010
24	development	Full maturity, bean 1-2	Pv06	Dm6.2	Days to maturity	Blair, Galeano et al., 2012
25	development	First flower, bean 1-10	Pv06	Df6.2	Days to flowering	Blair, Galeano et al., 2012
26	development	First flower, bean 1-7	Pv06	Df6.1	Days to flowering	Blair, Galeano et al., 2012
27	development	Full maturity, bean 1-1	Pv06	Dm6.1	Days to maturity	Blair, Galeano et al., 2012
28	development	First flower, bean 2-4	Pv06	df6.2	Days to flowering	Blair, Iriarte et al., 2006
29	development	Full maturity, bean 3-11	Pv06	DM6.1	Days to maturity	Perez-Vega, Paneda et al., 2010
30	development	Last flower 1-9	Pv06	DE6.1	Days to end of flowering	Perez-Vega, Paneda et al., 2010
31	development	First flower, bean 2-3	Pv06	df6.1	Days to flowering	Blair, Iriarte et al., 2006
32	development	Full maturity, bean 1-6	Pv06	Dm6.3	Days to maturity	Blair, Galeano et al., 2012
33	development	Full maturity, bean 2-2	Pv07	dm7.1	Days to maturity	Blair, Iriarte et al., 2006
34	development	Full maturity, bean 1-3	Pv07	Dm7.1	Days to maturity	Blair, Galeano et al., 2012
35	development	First flower, bean 1-3	Pv07	Df7.1	Days to flowering	Blair, Galeano et al., 2012
36	development	First flower, bean 3-7	Pv08	DF8	Days to flowering	Perez-Vega, Paneda et al., 2010
37	development	First flower, bean 2-5	Pv09	df9.1	Days to flowering	Blair, Iriarte et al., 2006
38	development	First flower, bean 2-7	Pv09	df9.2	Days to flowering	Blair, Iriarte et al., 2006
39	development	First flower, bean 1-5	Pv11	Df11.1	Days to flowering	Blair, Galeano et al., 2012
40	development	First flower, bean 2-9	Pv11	df11.1	Days to flowering	Blair, Iriarte et al., 2006
41	inorganic	Plant P 2-3	Pv02	Pup2.1	P accumulation	Beebe, Rojas-Pierce et al., 2006
42	inorganic	Plant P 2-1	Pv04	Pup4.1	P accumulation	Beebe, Rojas-Pierce et al., 2006
43	inorganic	Plant P 1-1	Pv04	Pup4.1	Phosphorus uptake in low phosphorus field (PUP, PAE)	Yan, Liao et al., 2004
44	inorganic	Plant P 1-2	Pv10	Pup10.1	Phosphorus uptake in low phosphorus field (PUP, PAE)	Yan, Liao et al., 2004
45	inorganic	Plant P 2-2	Pv10	Pup10.1	P accumulation	Beebe, Rojas-Pierce et al., 2006
46	organic	Seed coat tannin, soluble 1-1	Pv03	Cst3	Soluble condensed tannin concentration	Caldas and Blair, 2009
47	organic	Seed coat tannin 1-1	Pv03	Ctt3a	Total condensed tannin concentration	Caldas and Blair, 2009
48	organic	Seed coat tannin 1-2	Pv03	Ctt3b	Total condensed tannin concentration	Caldas and Blair, 2009
49	organic	Seed coat tannin, insoluble 1-3	Pv06	Cit6	Insoluble condensed tannin concentration	Caldas and Blair, 2009
50	organic	Seed coat tannin 1-3	Pv07	Ctt7	Total condensed tannin concentration	Caldas and Blair, 2009
51	organic	Seed coat tannin, insoluble 1-1	Pv07	Cit7	Insoluble condensed tannin concentration	Caldas and Blair, 2009
52	organic	Seed coat tannin, soluble 1-2	Pv07	Cst7	Soluble condensed tannin concentration	Caldas and Blair, 2009
53	organic	Seed coat tannin, soluble 1-3	Pv08	Cst8	Soluble condensed tannin concentration	Caldas and Blair, 2009
54	organic	Seed coat tannin 1-4	Pv08	Ctt8	Total condensed tannin concentration	Caldas and Blair, 2009
55	organic	Seed coat tannin, insoluble 1-2	Pv09	Cit9	Insoluble condensed tannin concentration	Caldas and Blair, 2009
56	organic	Seed coat tannin 1-5	Pv10	Ctt10	Total condensed tannin concentration	Caldas and Blair, 2009
57	organic	Seed coat tannin, soluble 1-4	Pv10	Cst10	Soluble condensed tannin concentration	Caldas and Blair, 2009
58	root	Root weight 1-1	Pv01	Rdw1.1	Root Dry Weight	Lopez-Marin, Rao et al., 2009
59	root	Root weight 1-2	Pv01	Rdw1.2	Root Dry Weight	Lopez-Marin, Rao et al., 2009
60	root	Root hair length, basal 1-1	Pv01	Bhl1.1	Total root hair length for basal roots (TRHL-br, THL-Br)	Yan, Liao et al., 2004
61	root	Root hair length, primary 1-1	Pv01	Th1.1	Total root hair length for tap roots (TRHL-tr, THL-Tr)	Yan, Liao et al., 2004
62	root	Root length, specific 2-5	Pv01	Srl1.1	Specific root length	Beebe, Rojas-Pierce et al., 2006
63	root	Root length, adventitious specific 1-1	Pv02	HPSRL_AdvF.1	Specific Root Length of Adventitious Roots	Ochoa, Blair et al., 2006
64	root	Root length, specific 1-1	Pv02	Srl2.1	Specific Root Length	Lopez-Marin, Rao et al., 2009
65	root	Root weight, adventitious 1-1	Pv02	HPAdvDWF.1	Adventitious Root Biomass (Dry Weight)	Ochoa, Blair et al., 2006
66	root	Root length, adventitious specific 1-6	Pv02	LPSRL_AdvF.1	Specific Root Length of Adventitious Roots	Ochoa, Blair et al., 2006
67	root	Root density, adventitious 1-3	Pv02	LPAadvNoF.1	Number of Adventitious Roots	Ochoa, Blair et al., 2006

68	root	Root length, adventitious 1-1	Pv02	HPAdv_LF.1	Adventitious Root Length	Ochoa, Blair et al., 2006
69	root	Root density 1-1	Pv03	Nrt3.1	Number of Root Tips	Lopez-Marin, Rao et al., 2009
70	root	Root length, specific 2-3	Pv03	Srl3.1	Specific root length	Beebe, Rojas-Pierce et al., 2006
71	root	Root hair density, basal 1-1	Pv03	Bhd3.1	Root hair density for basal roots (RHD-br, RHD-Br)	Yan, Liao et al., 2004
72	root	Root length, basal 1-1	Pv03	Brl3.1	Basal root length	Beebe, Rojas-Pierce et al., 2006
73	root	Root weight, basal 1-1	Pv03	Brd3.1	Basal root dry weight	Beebe, Rojas-Pierce et al., 2006
74	root	Root length, primary 1-1	Pv03	Trl3.1	Taproot root length	Beebe, Rojas-Pierce et al., 2006
75	root	Root hair length, primary 1-2	Pv03	Thl3.1	Total root hair length for tap roots (TRHL-tr, THL-Tr)	Yan, Liao et al., 2004
76	root	Root proton exudation rate 1-1	Pv03	Her3.1	Proton (H+) Exudation Rate (HER)	Yan, Liao et al., 2004
77	root	Root length, adventitious specific 1-7	Pv04	LPSRL_AdvGH.1	Specific Root Length of Adventitious Roots	Ochoa, Blair et al., 2006
78	root	Root length 2-1	Pv04	Rlf4.1	Root length	Beebe, Rojas-Pierce et al., 2006
79	root	Root length 2-5	Pv04	Rlf4.2	Root length	Beebe, Rojas-Pierce et al., 2006
80	root	Root organic acid exudation 1-1	Pv04	Tae4.1	Total Acid Exudation (TAE)	Yan, Liao et al., 2004
81	root	Root proton exudation 1-1	Pv04	Hex4.1	Proton (H+) Exudation (HEX, THE)	Yan, Liao et al., 2004
82	root	Root length, specific 1-2	Pv05	Srl5.1	Specific Root Length	Lopez-Marin, Rao et al., 2009
83	root	Root density 1-2	Pv05	Nrt5.1	Number of Root Tips	Lopez-Marin, Rao et al., 2009
84	root	Root organic acid exudation 1-2	Pv05	Tae5.1	Total Acid Exudation (TAE)	Yan, Liao et al., 2004
85	root	Root organic acid exudation 1-3	Pv05	Tae5.2	Total Acid Exudation (TAE)	Yan, Liao et al., 2004
86	root	Root length 1-1	Pv06	Trl6.1	Total Root Length	Lopez-Marin, Rao et al., 2009
87	root	Root length, adventitious specific 1-3	Pv06	HPSRL_AdvGH.1	Specific Root Length of Adventitious Roots	Ochoa, Blair et al., 2006
88	root	Root weight, adventitious 1-2	Pv06	HPAdvDWF.2	Adventitious Root Biomass (Dry Weight)	Ochoa, Blair et al., 2006
89	root	Root width 1-1	Pv06	Ard6.1	Average Root Diameter	Lopez-Marin, Rao et al., 2009
90	root	Root width 1-2	Pv07	Ard7.1	Average Root Diameter	Lopez-Marin, Rao et al., 2009
91	root	Root length 2-2	Pv07	Rlf7.1	Root length	Beebe, Rojas-Pierce et al., 2006
92	root	Root density, adventitious 1-1	Pv07	HPAdvNoF.1	Number of Adventitious Roots	Ochoa, Blair et al., 2006
93	root	Root weight, basal 1-2	Pv07	Brd7.1	Basal root dry weight	Beebe, Rojas-Pierce et al., 2006
94	root	Root length, specific 2-4	Pv07	Srl7.2	Specific root length	Beebe, Rojas-Pierce et al., 2006
95	root	Root length 2-6	Pv07	Rlf7.2	Root length	Beebe, Rojas-Pierce et al., 2006
96	root	Root length, adventitious specific 1-2	Pv07	HPSRL_AdvF.2	Specific Root Length of Adventitious Roots	Ochoa, Blair et al., 2006
97	root	Root length, specific 2-6	Pv07	Srl7.1	Specific root length	Beebe, Rojas-Pierce et al., 2006
98	root	Root length, specific 1-3	Pv07	Srl7.1	Specific Root Length	Lopez-Marin, Rao et al., 2009
99	root	Root length, adventitious specific 1-4	Pv07	HPSRL_AdvGH.2	Specific Root Length of Adventitious Roots	Ochoa, Blair et al., 2006
100	root	Root length 1-2	Pv08	Trl8.1	Total Root Length	Lopez-Marin, Rao et al., 2009
101	root	Root length 1-3	Pv08	Trl8.2	Total Root Length	Lopez-Marin, Rao et al., 2009
102	root	Root weight, primary 1-1	Pv08	Trd8.1	Taproot dry weight	Beebe, Rojas-Pierce et al., 2006
103	root	Root length 2-4	Pv08	Rlf8.2	Root length	Beebe, Rojas-Pierce et al., 2006
104	root	Root length, specific 1-4	Pv08	Srl8.1	Specific Root Length	Lopez-Marin, Rao et al., 2009
105	root	Root proton exudation rate 1-2	Pv08	Her8.1	Proton (H+) Exudation Rate (HER)	Yan, Liao et al., 2004
106	root	Root length, adventitious specific 1-8	Pv08	LPSRL_AdvGH.2	Specific Root Length of Adventitious Roots	Ochoa, Blair et al., 2006
107	root	Root length 2-3	Pv08	Rlf8.1	Root length	Beebe, Rojas-Pierce et al., 2006
108	root	Root length, specific 2-1	Pv08	Srl8.1	Specific root length	Beebe, Rojas-Pierce et al., 2006
109	root	Root weight, adventitious 1-4	Pv08	HPAdvDWH.1	Adventitious Root Biomass (Dry Weight)	Ochoa, Blair et al., 2006
110	root	Root length, adventitious 1-4	Pv08	HPAdv_LGH.1	Adventitious Root Length	Ochoa, Blair et al., 2006
111	root	Root length, specific 1-5	Pv09	Srl9.1	Specific Root Length	Lopez-Marin, Rao et al., 2009
112	root	Root density 1-3	Pv09	Nrt9.1	Number of Root Tips	Lopez-Marin, Rao et al., 2009
113	root	Root density 1-4	Pv09	Nrt9.2	Number of Root Tips	Lopez-Marin, Rao et al., 2009
114	root	Root length, adventitious 1-2	Pv09	HPAdv_LF.2	Adventitious Root Length	Ochoa, Blair et al., 2006
115	root	Root weight, adventitious 1-3	Pv09	HPAdvDWF.3	Adventitious Root Biomass (Dry Weight)	Ochoa, Blair et al., 2006
116	root	Root density, adventitious 1-2	Pv09	HPAdvNoF.2	Number of Adventitious Roots	Ochoa, Blair et al., 2006
117	root	Root density, adventitious 1-4	Pv09	LPAdvNoF.2	Number of Adventitious Roots	Ochoa, Blair et al., 2006
118	root	Root density 1-5	Pv09	Nrt9.3	Number of Root Tips	Lopez-Marin, Rao et al., 2009
119	root	Root hair length, primary 1-3	Pv09	Thl9.1	Total root hair length for tap roots (TRHL-tr, THL-Tr)	Yan, Liao et al., 2004
120	root	Root length 1-4	Pv09	Trl9.1	Total Root Length	Lopez-Marin, Rao et al., 2009
121	root	Root weight, primary 1-2	Pv09	Trd9.1	Taproot dry weight	Beebe, Rojas-Pierce et al., 2006
122	root	Root length, specific 2-7	Pv10	Srl10.2	Specific root length	Beebe, Rojas-Pierce et al., 2006
123	root	Root proton exudation 1-2	Pv10	Hex10.1	Proton (H+) Exudation (HEX, THE)	Yan, Liao et al., 2004
124	root	Root length, specific 2-2	Pv10	Srl10.1	NA	NA
125	root	Root hair density, basal 1-2	Pv10	Bhd10.1	Root hair density for basal roots (RHD-br, RHD-Br)	Yan, Liao et al., 2004
126	root	Root hair length, basal 1-2	Pv10	Bhl10.1	Total root hair length for basal roots (TRHL-br, THL-Br)	Yan, Liao et al., 2004
127	root	Root length, basal 1-2	Pv10	Brl10.1	Basal root length	Beebe, Rojas-Pierce et al., 2006
128	root	Root weight, basal 1-3	Pv10	Brd10.1	Basal root dry weight	Beebe, Rojas-Pierce et al., 2006
129	root	Root organic acid exudation 1-4	Pv10	Tae10.1	Total Acid Exudation (TAE)	Yan, Liao et al., 2004
130	root	Root proton exudation 1-3	Pv10	Hex10.2	Proton (H+) Exudation (HEX, THE)	Yan, Liao et al., 2004
131	root	Root length, adventitious specific 1-5	Pv10	HPSRL_AdvGH.3	Specific Root Length of Adventitious Roots	Ochoa, Blair et al., 2006
132	root	Root length 2-7	Pv11	Rlf11.1	Root length	Beebe, Rojas-Pierce et al., 2006
133	root	Root length 1-5	Pv11	Trl11.1	NA	NA
134	root	Root weight 1-3	Pv11	Rdw11.1	Root Dry Weight	Lopez-Marin, Rao et al., 2009
135	root	Root length 1-6	Pv11	Trl11.2	Total Root Length	Lopez-Marin, Rao et al., 2009
136	root	Root weight, primary 1-3	Pv11	Trd11.1	Taproot dry weight	Beebe, Rojas-Pierce et al., 2006
137	root	Root density 1-6	Pv11	Nrt11.1	Number of Root Tips	Lopez-Marin, Rao et al., 2009
138	root	Root weight 1-4	Pv11	Rdw11.2	Root Dry Weight	Lopez-Marin, Rao et al., 2009
139	root	Root weight 1-5	Pv11	Rdw11.3	Root Dry Weight	Lopez-Marin, Rao et al., 2009
140	root	Root hair density, basal 1-3	Pv11	Bhd11.1	Root hair density for basal roots (RHD-br, RHD-Br)	Yan, Liao et al., 2004
141	root	Root length, adventitious 1-3	Pv11	HPAdv_LF.3	Adventitious Root Length	Ochoa, Blair et al., 2006

142	seed	Seed weight 3-2	Pv02	sw2.2	Seed weight	Blair, Iriarte et al., 2006
143	seed	Seed weight 1-4	Pv02	Sw2.2	Seed weight	Blair, Galeano et al., 2012
144	seed	Seed length 1-1	Pv02	SL2	Seed length	Perez-Vega, Paneda et al., 2010
145	seed	Seed weight 1-1	Pv02	Sw2.1	Seed weight	Blair, Galeano et al., 2012
146	seed	Seed weight 3-1	Pv02	sw2.1	Seed weight	Blair, Iriarte et al., 2006
147	seed	Seed weight 1-13	Pv02	Sw2.4	Seed weight	Blair, Galeano et al., 2012
148	seed	Seed weight 1-18	Pv02	Sw2.5	Seed weight	Blair, Galeano et al., 2012
149	seed	Seed weight 1-19	Pv02	Sw2.6	Seed weight	Blair, Galeano et al., 2012
150	seed	Seed weight 1-5	Pv02	Sw2.3	Seed weight	Blair, Galeano et al., 2012
151	seed	Seed water absorption 1-1	Pv03	WA3	Water absorption	Perez-Vega, Paneda et al., 2010
152	seed	Seed weight 3-4	Pv03	sw3.1	Seed weight	Blair, Iriarte et al., 2006
153	seed	Seed weight 2-1	Pv03	Swf3.1	Seed weight	Beebe, Rojas-Pierce et al., 2006
154	seed	Seed width 1-1	Pv03	W13	Seed width	Perez-Vega, Paneda et al., 2010
155	seed	Seed coat proportion 1-1	Pv03	CP3	Coat proportion	Perez-Vega, Paneda et al., 2010
156	seed	Seed length 1-5	Pv03	SL3	Seed length	Perez-Vega, Paneda et al., 2010
157	seed	Seed water absorption 1-3	Pv04	WA4	Water absorption	Perez-Vega, Paneda et al., 2010
158	seed	Seed weight 2-2	Pv04	Swf4.1	Seed weight	Beebe, Rojas-Pierce et al., 2006
159	seed	Seed weight 1-20	Pv05	Sw5.3	Seed weight	Blair, Galeano et al., 2012
160	seed	Seed weight 1-14	Pv05	Sw5.2	Seed weight	Blair, Galeano et al., 2012
161	seed	Seed weight 1-6	Pv05	Sw5.1	Seed weight	Blair, Galeano et al., 2012
162	seed	Seed weight 1-25	Pv06	Sw6.14	Seed weight	Blair, Galeano et al., 2012
163	seed	Seed weight 4-1	Pv06	SW6	Seed weight	Perez-Vega, Paneda et al., 2010
164	seed	Seed weight 1-7	Pv06	Sw6.3	Seed weight	Blair, Galeano et al., 2012
165	seed	Seed length 1-9	Pv06	SL6	Seed length	Perez-Vega, Paneda et al., 2010
166	seed	Seed weight 1-8	Pv06	Sw6.4	Seed weight	Blair, Galeano et al., 2012
167	seed	Seed height 1-1	Pv06	SH6	Seed height	Perez-Vega, Paneda et al., 2010
168	seed	Seed weight 1-15	Pv06	Sw6.9	Seed weight	Blair, Galeano et al., 2012
169	seed	Seed weight 1-9	Pv06	Sw6.5	Seed weight	Blair, Galeano et al., 2012
170	seed	Seed width 1-4	Pv06	W16	Seed width	Perez-Vega, Paneda et al., 2010
171	seed	Seed weight 1-2	Pv06	Sw6.1	Seed weight	Blair, Galeano et al., 2012
172	seed	Seed weight 1-26	Pv06	Sw6.15	Seed weight	Blair, Galeano et al., 2012
173	seed	Seed weight 1-21	Pv06	Sw6.12	Seed weight	Blair, Galeano et al., 2012
174	seed	Seed weight 1-10	Pv06	Sw6.6	Seed weight	Blair, Galeano et al., 2012
175	seed	Seed weight 1-16	Pv06	Sw6.10	Seed weight	Blair, Galeano et al., 2012
176	seed	Seed weight 1-3	Pv06	Sw6.2	Seed weight	Blair, Galeano et al., 2012
177	seed	Seed weight 1-17	Pv06	Sw6.11	Seed weight	Blair, Galeano et al., 2012
178	seed	Seed weight 1-11	Pv06	Sw6.7	Seed weight	Blair, Galeano et al., 2012
179	seed	Seed weight 1-27	Pv06	Sw6.16	Seed weight	Blair, Galeano et al., 2012
180	seed	Seed weight 1-22	Pv06	Sw6.13	Seed weight	Blair, Galeano et al., 2012
181	seed	Seed weight 1-12	Pv06	Sw6.8	Seed weight	Blair, Galeano et al., 2012
182	seed	Seed weight 3-5	Pv06	sw6.1	Seed weight	Blair, Iriarte et al., 2006
183	seed	Seed weight 3-6	Pv07	sw7.1	Seed weight	Blair, Iriarte et al., 2006
184	seed	Seed coat proportion 1-3	Pv07	CP7	Coat proportion	Perez-Vega, Paneda et al., 2010
185	seed	Seed width 1-6	Pv07	W17	Seed width	Perez-Vega, Paneda et al., 2010
186	seed	Seed weight 3-10	Pv08	sw8.2	Seed weight	Blair, Iriarte et al., 2006
187	seed	Seed weight 3-8	Pv08	sw8.1	Seed weight	Blair, Iriarte et al., 2006
188	seed	Seed weight 4-5	Pv08	SW8.1	Seed weight	Perez-Vega, Paneda et al., 2010
189	seed	Seed length 1-13	Pv08	SL8	Seed length	Perez-Vega, Paneda et al., 2010
190	seed	Seed height 1-3	Pv08	SH8	Seed height	Perez-Vega, Paneda et al., 2010
191	seed	Seed weight 4-8	Pv08	SW8.2	Seed weight	Perez-Vega, Paneda et al., 2010
192	seed	Seed weight 1-24	Pv09	Sw9.2	Seed weight	Blair, Galeano et al., 2012
193	seed	Seed weight 1-23	Pv09	Sw9.1	Seed weight	Blair, Galeano et al., 2012
194	seed	Seed weight 3-12	Pv09	sw9.1	Seed weight	Blair, Iriarte et al., 2006
195	seed	Seed weight 3-13	Pv10	sw10.1	Seed weight	Blair, Iriarte et al., 2006
196	seed	Seed length 1-16	Pv10	SL10	Seed length	Perez-Vega, Paneda et al., 2010
197	seed	Seed weight 2-3	Pv11	Swf11.1	Seed weight	Beebe, Rojas-Pierce et al., 2006
198	seed	Seed weight 3-14	Pv11	sw11.1	Seed weight	Blair, Iriarte et al., 2006
199	whole-plant	Plant height 1-1	Pv01	ph1.1	Plant height	Blair, Iriarte et al., 2006
200	whole-plant	Internode length 1-1	Pv03	Int1	Internode length	Checa and Blair, 2008
201	whole-plant	Plant height 2-1	Pv03	Plh1-1	Plant height 45 days after planting	Checa and Blair, 2008
202	whole-plant	Internode length 1-6	Pv04	Int4	Internode length	Checa and Blair, 2008
203	whole-plant	Plant height 2-6	Pv04	Plh2-2	Plant height 75 days after planting	Checa and Blair, 2008
204	whole-plant	Plant height 2-2	Pv04	Plh1-2	Plant height 45 days after planting	Checa and Blair, 2008
205	whole-plant	Internode length 1-2	Pv04	Int2	Internode length	Checa and Blair, 2008
206	whole-plant	Climbing 1-3	Pv04	Cab1-2	Climbing ability 45 days after planting	Checa and Blair, 2008
207	whole-plant	Climbing 1-1	Pv04	Cab1-1	Climbing ability 45 days after planting	Checa and Blair, 2008
208	whole-plant	Plant height 2-5	Pv04	Plh2-1	Plant height 75 days after planting	Checa and Blair, 2008
209	whole-plant	Climbing 1-8	Pv04	Cab2-1	Climbing ability 75 days after planting	Checa and Blair, 2008
210	whole-plant	Internode length 1-4	Pv04	Int3	Internode length	Checa and Blair, 2008
211	whole-plant	Branching 1-1	Pv04	Brn1	Branch number	Checa and Blair, 2008
212	whole-plant	Plant height 2-3	Pv04	Plh1-3	Plant height 45 days after planting	Checa and Blair, 2008
213	whole-plant	Climbing 1-4	Pv05	Cab1-3	Climbing ability 45 days after planting	Checa and Blair, 2008
214	whole-plant	Plant height 1-3	Pv06	ph6.2	Plant height	Blair, Iriarte et al., 2006
215	whole-plant	Canopy width 1-2	Pv06	pw6.2	Plant width	Blair, Iriarte et al., 2006

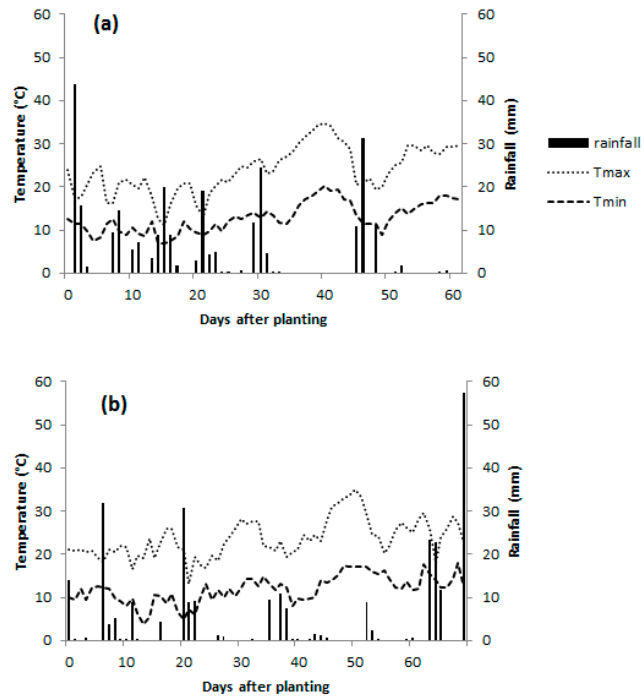
216	whole-plant	Plant height 1-2	Pv06	ph6.1	Plant height	Blair, Iriarte et al., 2006
217	whole-plant	Canopy width 1-1	Pv06	pw6.1	Plant width	Blair, Iriarte et al., 2006
218	whole-plant	Plant height 1-4	Pv07	ph7.1	Plant height	Blair, Iriarte et al., 2006
219	whole-plant	Canopy width 1-3	Pv07	pw7.1	Plant width	Blair, Iriarte et al., 2006
220	whole-plant	Climbing 1-5	Pv07	Cab1-4	Climbing ability 45 days after planting	Checa and Blair, 2008
221	whole-plant	Plant height 2-4	Pv08	Plh1-4	Plant height 45 days after planting	Checa and Blair, 2008
222	whole-plant	Climbing 1-6	Pv10	Cab1-5	Climbing ability 45 days after planting	Checa and Blair, 2008
223	whole-plant	Plant height 2-7	Pv11	Plh2-3	Plant height 75 days after planting	Checa and Blair, 2008
224	whole-plant	Climbing 1-7	Pv11	Cab1-6	Climbing ability 45 days after planting	Checa and Blair, 2008
225	yield	Seed yield 2-1	Pv02	yld2.1	Yield	Blair, Iriarte et al., 2006
226	yield	Seed yield 2-2	Pv03	yld3.1	Yield	Blair, Iriarte et al., 2006
227	yield	Seed yield 1-1	Pv03	Yld3.1	Yield	Blair, Galeano et al., 2012
228	yield	Seed yield/Full maturity, bean 1-1	Pv03	Ypd3.1	Yield per day	Blair, Galeano et al., 2012
229	yield	Seed yield/Full maturity, bean 1-5	Pv03	Ypd3.2	Yield per day	Blair, Galeano et al., 2012
230	yield	Seed yield 1-5	Pv03	Yld3.2	Yield	Blair, Galeano et al., 2012
231	yield	Seed yield/Full maturity, bean 1-6	Pv03	Ypd3.3	Yield per day	Blair, Galeano et al., 2012
232	yield	Seed yield 1-6	Pv03	Yld3.3	Yield	Blair, Galeano et al., 2012
233	yield	Seed yield 1-7	Pv03	Yld3.4	Yield	Blair, Galeano et al., 2012
234	yield	Seed yield 2-3	Pv03	yld3.2	Yield	Blair, Iriarte et al., 2006
235	yield	Seed yield 2-4	Pv04	yld4.1	Yield	Blair, Iriarte et al., 2006
236	yield	Seed yield/Full maturity, bean 1-7	Pv04	Ypd4.2	Yield per day	Blair, Galeano et al., 2012
237	yield	Seed yield 2-5	Pv04	yld4.2	Yield	Blair, Iriarte et al., 2006
238	yield	Seed yield 2-6	Pv04	yld4.3	Yield	Blair, Iriarte et al., 2006
239	yield	Seed yield/Full maturity, bean 1-8	Pv04	Ypd4.3	Yield per day	Blair, Galeano et al., 2012
240	yield	Seed yield/Full maturity, bean 1-9	Pv04	Ypd4.4	Yield per day	Blair, Galeano et al., 2012
241	yield	Seed yield 1-3	Pv04	Yld4.1	Yield	Blair, Galeano et al., 2012
242	yield	Seed yield/Full maturity, bean 1-3	Pv04	Ypd4.1	Yield per day	Blair, Galeano et al., 2012
243	yield	Seed yield 2-7	Pv04	yld4.4	Yield	Blair, Iriarte et al., 2006
244	yield	Seed yield 1-4	Pv06	Yld6.1	Yield	Blair, Galeano et al., 2012
245	yield	Seed yield/Full maturity, bean 1-4	Pv06	Ypd6.1	Yield per day	Blair, Galeano et al., 2012
246	yield	Seeds per plant 1-1	Pv06	sp6.1	Seeds per plant	Blair, Iriarte et al., 2006
247	yield	Seed yield 1-8	Pv07	Yld7.1	Yield	Blair, Galeano et al., 2012
248	yield	Seeds per plant 1-2	Pv07	sp7.1	Seeds per plant	Blair, Iriarte et al., 2006
249	yield	Pods per plant 1-1	Pv07	pp7.2	Pods per plant	Blair, Iriarte et al., 2006
250	yield	Seeds per plant 1-3	Pv07	sp7.2	Seeds per plant	Blair, Iriarte et al., 2006
251	yield	Seed yield/Full maturity, bean 1-10	Pv08	Ypd8.2	Yield per day	Blair, Galeano et al., 2012
252	yield	Seed yield 1-9	Pv08	Yld8.2	Yield	Blair, Galeano et al., 2012
253	yield	Seed yield 1-2	Pv08	Yld8.1	Yield	Blair, Galeano et al., 2012
254	yield	Seed yield/Full maturity, bean 1-2	Pv08	Ypd8.1	Yield per day	Blair, Galeano et al., 2012
255	yield	Seed yield 2-8	Pv09	yld9.1	Yield	Blair, Iriarte et al., 2006
256	yield	Seed yield 2-9	Pv09	yld9.2	Yield	Blair, Iriarte et al., 2006
257	yield	Pods per plant 1-2	Pv09	pp9.2	Pods per plant	Blair, Iriarte et al., 2006
258	yield	Seed yield 1-10	Pv10	Yld10.1	Yield	Blair, Galeano et al., 2012
259	yield	Seed yield/Full maturity, bean 1-11	Pv10	Ypd10.1	Yield per day	Blair, Galeano et al., 2012
260	yield	Pods per plant 1-3	Pv11	pp11.3	Pods per plant	Blair, Iriarte et al., 2006

**Table S3.** Descriptive statistics for measured physiology-associated, phenological and yield traits in the RIL population for both seasons and different experiment conditions.

Trait	Year	Time of assessment <sup>1</sup>	'Tiber'		'Starozagorski'		RIL				
			Treatment	Control	Treatment	Control	mean	SD	Min	Max	CV
Wp	2013	Control	-0.2 ± 0.1	-0.2 ± 0.1	-0.3 ± 0.1	-0.3 ± 0.1	-0.2	0.1	-0.3	-0.1	31.3
	2013	Moderate drought	-0.4 ± 0.1	-0.2 ± 0.1	-0.3 ± 0.2	-0.2 ± 0.1	-0.4	0.2	-1.1	-0.1	51.3
	2013	Severe drought	-2.4 ± 0.7	-0.4 ± 0.2	-2.5 ± 0.6	-0.3 ± 0	-2.0	0.6	-3.3	-0.5	31.1
	2014	Control	-0.6 ± 0	-0.6 ± 0	-0.6 ± 0.1	-0.6 ± 0.1	-0.6	0.1	-0.9	-0.3	18.8
	2014	Moderate drought	-2.1 ± 0.2	-0.6 ± 0.3	-1.9 ± 0.8	-0.4 ± 0.1	-2.0	0.6	-4	-0.9	27.9
	2014	Severe drought <sup>2</sup>	-1.0	-0.5	-1	-0.4	-1.2	0.4	-3	-0.6	34.1
ΦPSII	2013	Control	0.7 ± 0	0.7 ± 0	0.7 ± 0	0.7 ± 0	0.7	0.1	0.6	0.8	7.1
	2013	Moderate drought	0.8 ± 0	0.8 ± 0	0.7 ± 0	0.8 ± 0	0.7	0.1	0.5	0.8	9
	2013	Severe drought	0.7 ± 0	0.8 ± 0	0.6 ± 0	0.8 ± 0	0.6	0.1	0.2	0.7	19.4
	2014	Control	0.7 ± 0	0.7 ± 0	0.8 ± 0	0.8 ± 0	0.8	0.0	0.7	0.8	3.9
	2014	Moderate drought	0.4 ± 0.1	0.8 ± 0	0.5 ± 0.1	0.8 ± 0	0.5	0.1	0.2	0.8	26.7
	2014	Severe drought	0.8 ± 0	0.7 ± 0.1	0.4 ± 0.1	0.8 ± 0	0.6	0.1	0	0.8	23
Df	2013	Continuously	38	38	38	38	39.9	2.5	38	47	6.2
	2014	Continuously	26	27	28	29	26.1	1.5	23	30	5.7
Dp	2013	Continuously	14	14	18	18	14.9	2.1	9	20	14.1
	2014	Continuously	6	5	5	5	5.2	1.6	2	11	31.2
Pp	2013	Re-watering	1.1	6.3	0	1.5	0.7	0.4	0	2	56.2
	2014	Re-watering	4.8	6.1	3.9	7.4	2.7	1.0	0	6.9	38.2
Sp	2013	Re-watering	1.5	1.2	0	1.4	1.6	0.5	0.8	2.8	30.1
	2014	Re-watering	3.2	3.1	2.7	2.5	2.7	0.6	1.2	4.9	22.8
Syp	2013	Re-watering	0.3	2.1	0	0.5	0.3	0.2	0	0.8	88
	2014	Re-watering	3.2	5.4	3.7	6.5	2.5	1.0	0	4.9	38.9
Hsm	2013	Re-watering	18.2	29	0	20.2	27.7	7.3	6	54	26.4
	2014	Re-watering	40	38.6	39.1	40	35.7	7.0	15	51.5	19.4

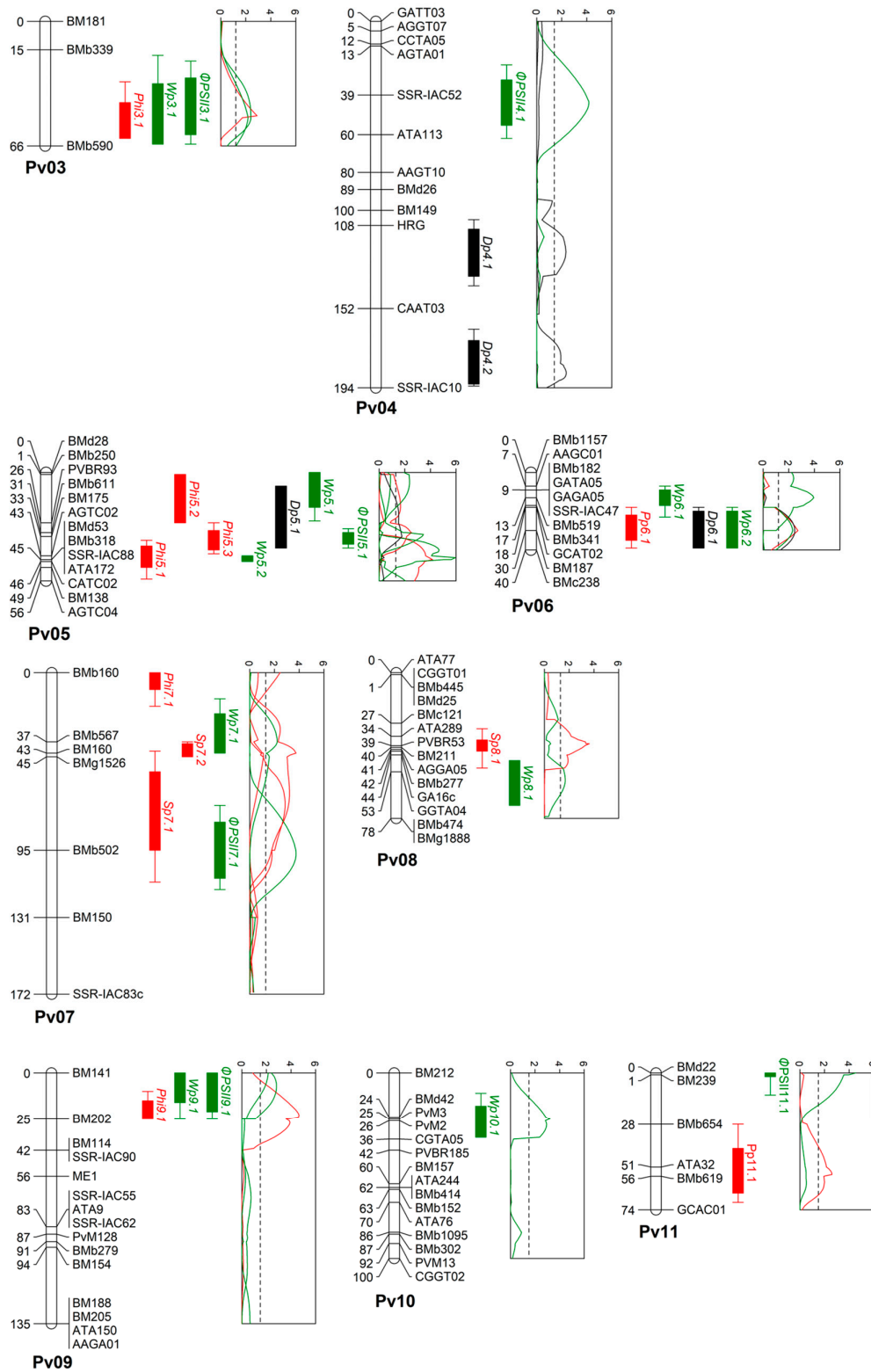
<sup>1</sup> Physiology-associated traits were assessed at three time-points: one day before discontinuation of watering (control), after 10–13 days of induced drought (moderate drought) and after 17–23 days of induced drought (severe drought). Phenological traits were assessed continuously and yield-associated traits were assessed at harvest (re-established watering). For parental cultivars, mean ± SE is displayed.

<sup>2</sup> In severe drought of 2014 only one plant per genotype was available for measurement of water potential.

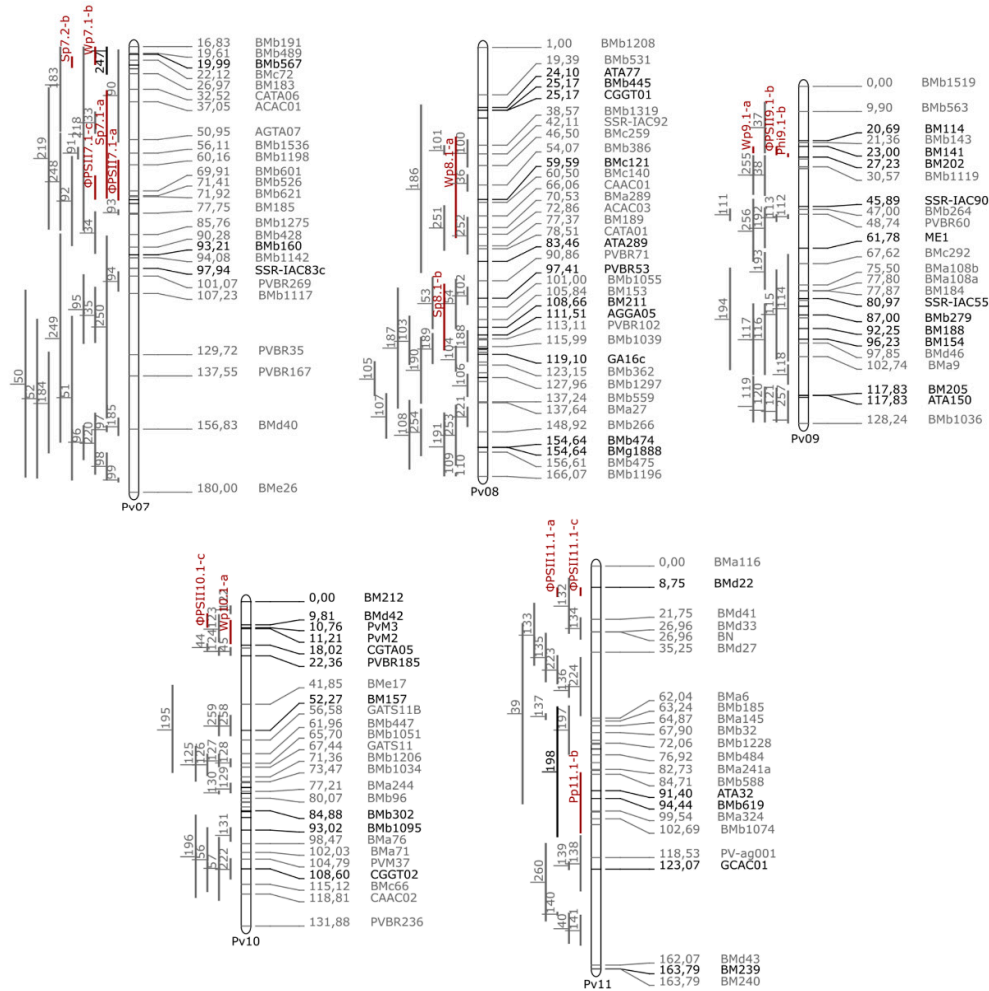


**Figure S1.** Outside temperatures (max, min) and rainfall distribution at greenhouse experiment station location during two successive years: (a) 2013; (b) 2014.

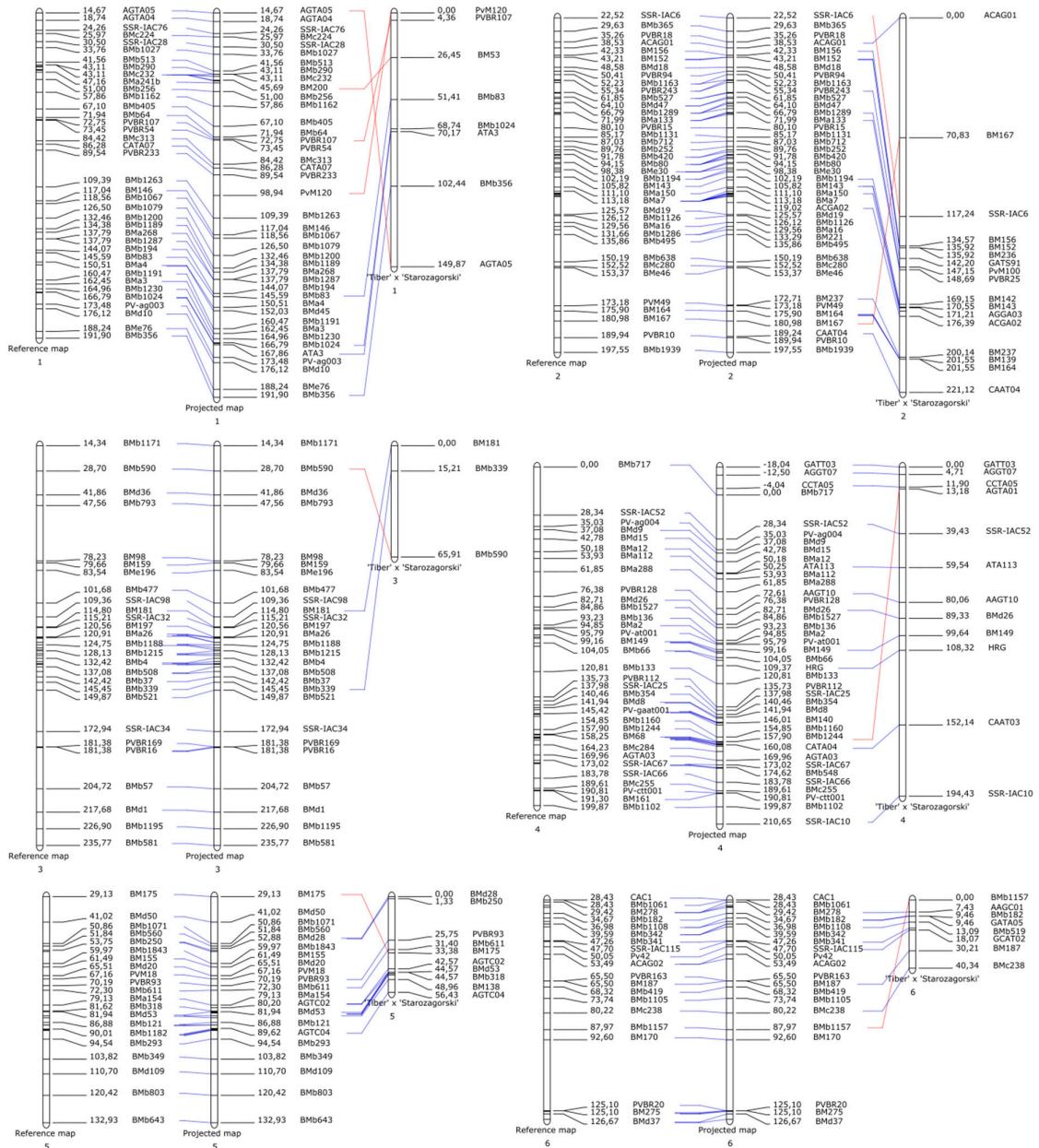




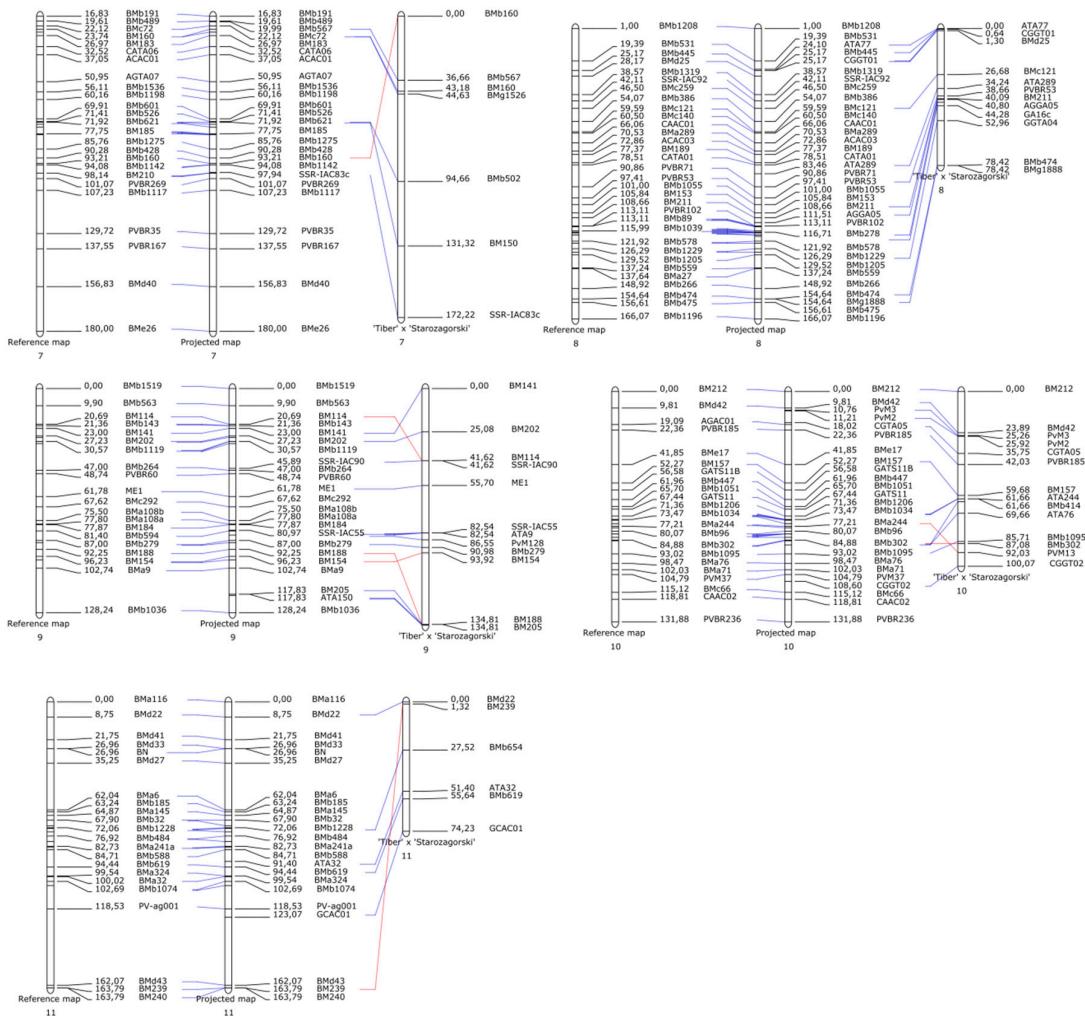
**Figure S2.** Common bean linkage groups Pv03 to Pv11 showing QTLs for physiology-associated traits, phenological traits and yield-associated traits in 'Tiber' × 'Starozagorski' genetic linkage map detected with single environment analysis.



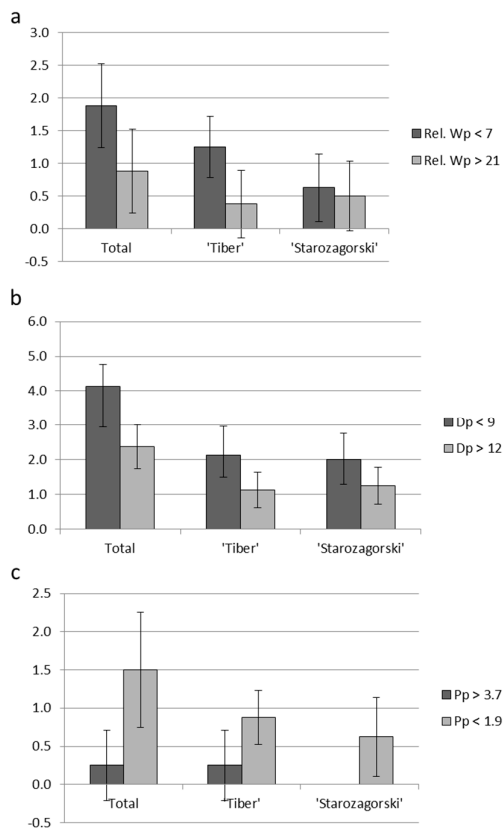
**Figure S3.** QTLs for physiology-associated traits, phenological traits and yield-associated traits on the integrated genetic map of the 'Tiber' x 'Starozagorski' recombinant inbred line population and common bean consensus map reported by Galeano *et al*, 2011. Markers and QTLs from the novel 'Tiber' x 'Starozagorski' genetic map are marked bold and QTLs are also colored red (for QTL names see Table 3). The suffix in QTL names denotes whether they were detected in single environment analysis (-a, -b) or QTL x Environment analysis (-c). For clarity reasons, not all loci names are displayed. For clarity reasons, not all loci names are displayed. QTLs from the consensus map are numbered (see Table S1) and colored gray for clarity reasons – only QTLs relevant for discussion are colored black.



**Figure S4.** Comparison of the order and distance between the SSR and AFLP loci of 'Tiber' x 'Starozagorski' map, reference map (Galeano *et al.* 2011) and the projected map for linkage groups 1 - 6. Blue lines indicate matching marker order and red lines indicate a mismatch.



**Figure S5.** Comparison of the order and distance between the SSR and AFLP loci of ‘Tiber’ x ‘Starozagorski’ map, reference map (Galeano *et al.* 2011) and the projected map for linkage groups 7 - 11. Blue lines indicate matching marker order and red lines indicate a mismatch.



**Figure S6.** Number of positive alleles for QTLs with high additive effects in both directions observed in top and bottom 10% of values for individual trait. a) Allele numbers for QTLs for relative water potential (Wp6.1, Wp8.1 and Wp9.1) in season 2013, b) Allele numbers for QTLs for days to pods (Dp1.1, Dp2.1 Dp4.1, Dp4.2, Dp5.1, and Dp6.1) in season 2014, c) Allele numbers for QTLs for pods per plant (Pp6.1, Pp11.1) for season 2013-14. Average number of positive alleles ( $\pm$  SD) is displayed.