

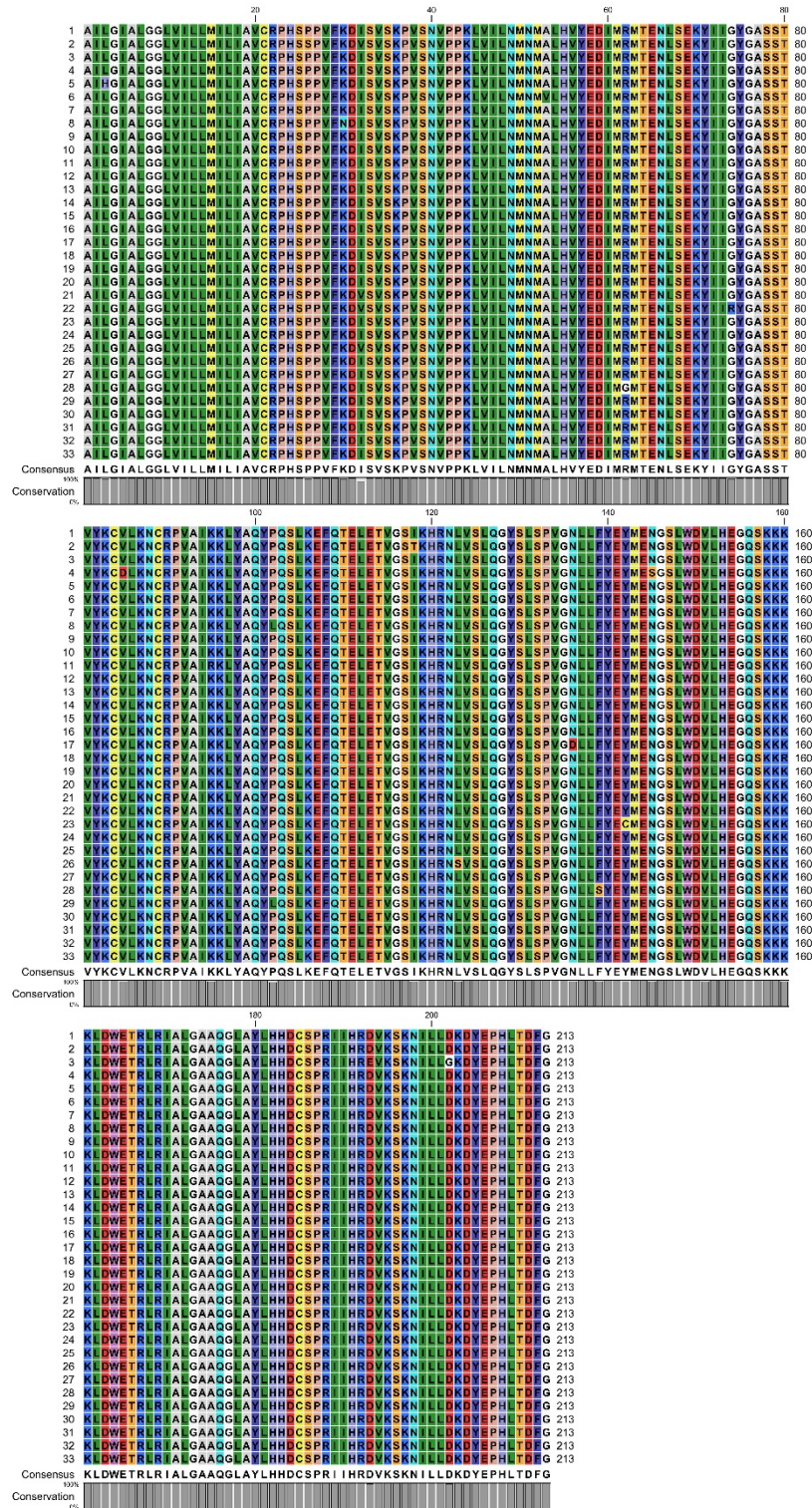


Fig. 1. Suppl. Comparison of amino acid sequences of partial *TaER-1* gene from 33 wheat genotypes. *Vertical axis* shows the amino acid sequences from 1 to 33 genotypes, while *horizontal axis* shows the non-synonymous mutation by a different colour within each column. Names of genotypes are given in Table 8 Suppl.

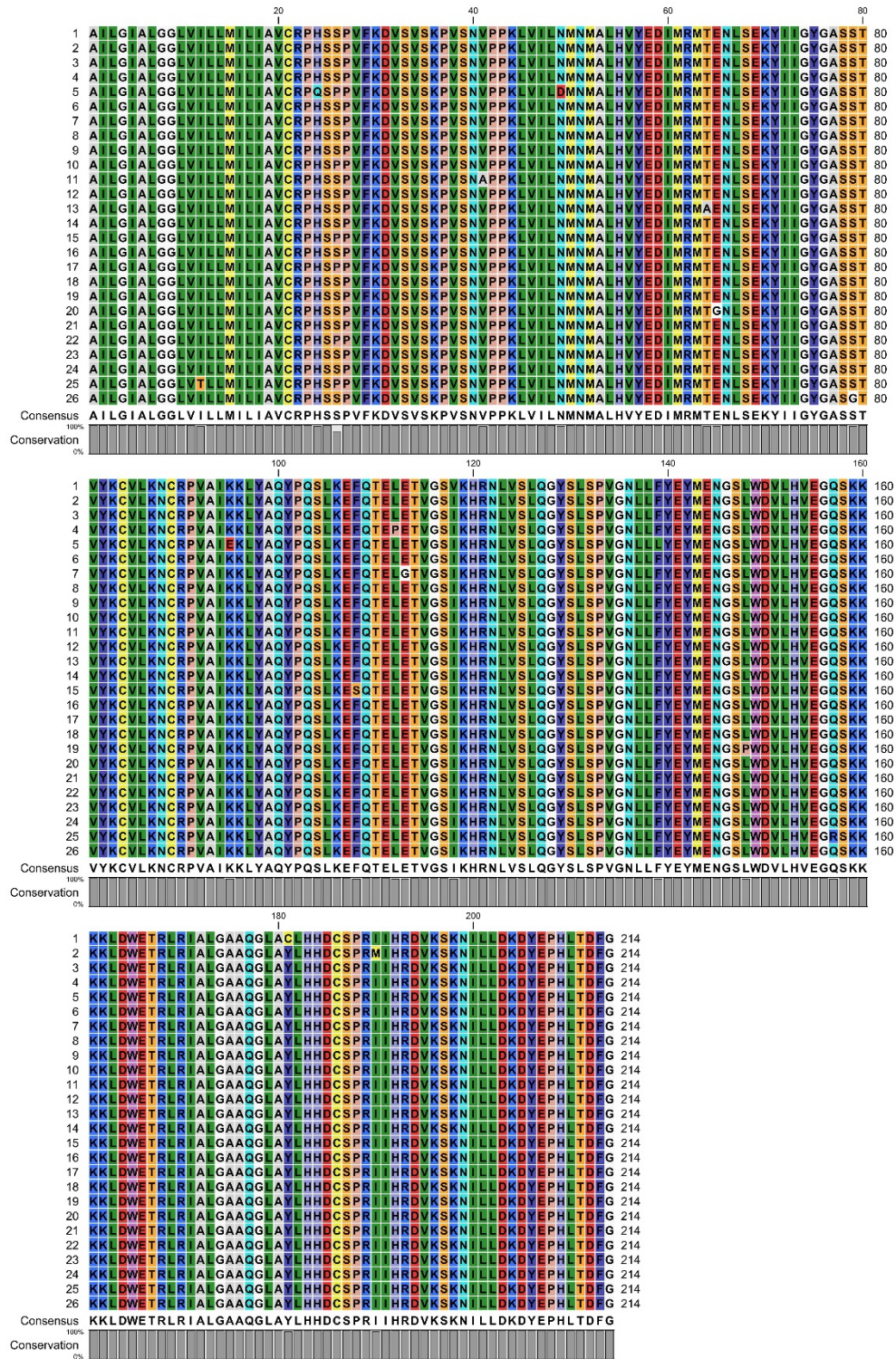


Fig. 2. Suppl. Comparison of amino acid sequences partial *TaER-2* gene from 26 wheat genotypes. *Vertical* axis shows the amino acid sequences from 1 to 26 genotypes, while *horizontal* axis shows the non-synonymous mutation by a different colour within each column. Names of genotypes are given in Table 9 Suppl.

Table 1 Suppl. List of genotypes with their planting regions and origins (WWR - winter wheat region, SWR - spring wheat region; Chinese province or Australian state).

No.	Genotype	Planting region	Origin
1	Luohan 6	Huang-huai WWR	Henan
2	Xinmai 19	Huang-huai WWR	Henan
3	Zhou 17	Huang-huai WWR	Henan
4	Zhou 19	Huang-huai WWR	Henan
5	Luohan 21	Huang-huai WWR	Henan
6	Shijiazhuang 8	Huang-huai WWR	Hebei
7	Changwu 134	Huang-huai WWR	Shaanxi
8	Changwu 863	Huang-huai WWR	Shaanxi
9	Changwu 521-7	Huang-huai WWR	Shaanxi
10	Shaan 229	Huang-huai WWR	Shaanxi
11	Xiaoyan 6	Huang-huai WWR	Shaanxi
12	Shanmai 168	Huang-huai WWR	Shaanxi
13	Pubing 201	Huang-huai WWR	Shaanxi
14	Shaan 512	Huang-huai WWR	Shaanxi
15	Xiaoyan 22-3	Huang-huai WWR	Shaanxi
16	Pubing 143	Huang-huai WWR	Shaanxi
17	Xinong 389	Huang-huai WWR	Shaanxi
18	Liken 2	Huang-huai WWR	Shaanxi
19	Lantian 10	Huang-huai WWR	Shaanxi
20	Xinong 811	Huang-huai WWR	Shaanxi
21	Qinnong 712	Huang-huai WWR	Shaanxi
22	Jiufeng 22	Huang-huai WWR	Shaanxi
23	Ligao 6	Huang-huai WWR	Shaanxi
24	Changwu 58-61	Huang-huai WWR	Shaanxi
25	Yuanfeng 175	Huang-huai WWR	Shaanxi
26	Yuanfeng 139	Huang-huai WWR	Shaanxi
27	Fengchan 3	Huang-huai WWR	Shaanxi
28	Xinong 889	Huang-huai WWR	Shaanxi
29	Xinong 979	Huang-huai WWR	Shaanxi
30	Xinong 928	Huang-huai WWR	Shaanxi
31	Shaan 7859	Huang-huai WWR	Shaanxi
32	Hanyou 98	Huang-huai WWR	Shandong
33	Yunhan 22-33	Huang-huai WWR	Shanxi
34	Xifeng 20	Huang-huai WWR	Gansu
35	Zhonghan 110	Northern WWR	Beijing
36	Jing 411	Northern WWR	Beijing
37	Xiaoyan 81	Northern WWR	Beijing
38	Youmai 2	Northern WWR	Shandong
39	Jinmai 47	Northern WWR	Shanxi
40	Jinan 18	Northern WWR	Shandong
41	Jining 13	Northern WWR	Shandong
42	Jining 18	Northern WWR	Shandong
43	Jinmai 33	Northern WWR	Shanxi
44	Jing 2001	Northwest WWR	Gansu
45	Ningchun 45	Northwest SWR	Ningxia
46	Hongmangmai (landrace)	Northwest SWR	Ningxia
47	Mianyang 11	Southwestern WWR	Sichuan
48	Drysdale	Australia	New South Wales
49	Quarrior	Australia	New South Wales

Table 2 Suppl. *BLASTn* output for amplified 1 105 bp *TaER-1* gene.

Organism	GeneBank accession No.	Similarity [%]	E-value
<i>Triticum aestivum</i> chromosome 7D (ER1)	JQ599260.2	100	0.0
<i>Triticum aestivum</i> chromosome 7B (ER2)	JQ599261.2	93	0.0
<i>Hordeum vulgare</i>	AK375830.1	100	2E-167
<i>Brachypodium distachyon</i>	XM003564085.1	94	9E-146
<i>Sorghum bicolor</i>	AF466199.1	87	5E-113
<i>Zea mays</i>	BT064379.1	87	2E-107
<i>Oryza sativa</i> var. <i>japonica</i>	APP004991.3	89	8E-37

Table 3 Suppl. *BLASTn* output for amplified 1108bp *TaER-2* gene.

Organism	GeneBank Accession No.	Similarity [%]	E-value
<i>Triticum aestivum</i> chromosome 7D (ER1)	JQ599260.2	95	0.0
<i>Triticum aestivum</i> chromosome 7B (ER2)	JQ599261.2	93	0.0
<i>Hordeum vulgare</i>	AK375830.1	97	4E-164
<i>Brachypodium distachyon</i>	XM003564085.1	93	2E-142
<i>Sorghum bicolor</i>	AF466199.1	86	1E-109
<i>Oryza sativa</i> var. <i>japonica</i>	APP004991.3	90	2E-38

Table 4 Suppl. The distribution of single nucleotide polymorphisms (SNPs) in exonic regions of 1 105 bp sequence of *TaER-1* gene.

No.	Position	Nucleotide change	Genotypes	No.	Position	Nucleotide change	Genotypes
1	8	T-A	5	21	579	T-C	3
2	57	T-C	2, 15	22	581	T-C	26
3	72	C-T	7, 21, 22, 25	23	591	T-C	14
4	76	C-T	2	24	614	T-C	11
5	90	A-C	8	25	618	G-A	10
6	94	A-G	2, 21, 22, 25	26	619	A-G	17
7	371	C-T	6	27	629	T-C	28
8	387	A-G	10	28	638	A-G	23
9	397	A-G	28	29	647	A-G	4
10	417	T-C	2	30	664	G-A	14
11	423	A-G	7	31	925	A-G	15
12	430	A-G	24	32	943	A-G	18
13	433	G-A	22	33	947	A-G	26
14	453	A-G	10	34	950	T-C	26
15	467	T-A	4	35	974	T-C	26
16	497	A-G	11	36	1025	C-G	26
17	517	C-T	31	37	1043	T-G	3
18	518	C-T	8,29	38	1069	A-G	3
19	566	T-C	2	39	1073	A-G	7
20	568	A-G	19				

Table 5 Suppl. The distribution of SNPs in intronic regions of 1 105 bp sequence of *TaER-1* gene.

No.	Position	Nucleotide change	Genotypes	No.	Position	Nucleotide change	Genotypes
1	121	T-C	8	17	213	T-C	6, 25
2	124	A-T	2	18	221	C-T	21, 22, 25
3	128	A-G	2, 21, 22, 25	19	248	C-T	21, 22, 25
4	130	G-A	21, 22, 25	20	258	A-T	33
5	148	C-T	21, 22, 25	21	262	A-G	2
6	158	C-G	21, 22, 25	22	268	C-A	21, 22, 25
7	174	G-A	2	23	297	T-A	2
8	174	G-C	21, 22, 25	24	320	T-C	13
9	184	C-T	2	25	702	A-G	14
10	186	G-A	21, 22, 25	26	703	T-C	12
11	188	G-A	2	27	706	C-T	15
12	190	G-A	2	28	724	A-G	10
13	192	G-T	21, 22, 25	29	836	T-C	8
14	198	T-C	2	30	900	A-G	4
15	200	T-G	2	31	909	T-C	21
16	206	G-A	2, 21, 22, 25	32	923	A-G	29

Table 6 Suppl. The distribution of SNPs in exonic regions of 1 108 bp sequence of *TaER-2* gene.

No.	Position	Nucleotide change	Genotypes	No.	Position	Nucleotide change	Genotypes
1	35	T-C	25	17	556	A-G	7
2	72	C-A	5	18	569	T-C	11, 17
3	75	T-C	24	19	570	A-G	1
4	76	T-C	5, 10, 15, 17, 22, 25	20	593	T-C	11
5	111	A-G	2	21	599	A-G	11
6	340	T-C	11	22	611	A-G	4, 5
7	363	A-G	5	23	614	A-G	13
8	392	A-G	6	24	633	T-C	5
9	408	A-G	13	25	661	T-C	19
10	412	A-G	20	26	934	A-G	25
11	422	C-T	5, 25	27	971	T-C	23
12	453	A-G	26	28	995	A-G	10,23
13	467	A-G	1	29	1006	A-G	1
14	501	A-G	5	30	1034	A-G	2
15	541	T-C	15	31	1046	T-C	5
16	553	T-C	4				

Table 7 Suppl. The distribution of SNPs in intronic regions of 1 108 bp sequence of *TaER-2* gene.

No.	Position	Nucleotide change	Genotypes
1	204	C-T	10, 17, 22
2	312	A-C	3
3	687	G-A	4, 5
4	777	T-C	23
5	814	T-C	2
6	859	T-C	17
7	886	A-G	14
8	892	A-G	23
9	916	T-C	21

Table 8 Suppl. Phenotypic data of 33 genotypes for association analysis with SNPs in 1 105 bp of *TaER-1*. CID - carbon isotope discrimination [‰]; P_N - photosynthetic rate [$\mu\text{mol m}^{-2} \text{s}^{-1}$]; g_s - stomatal conductance [$\text{mol}(\text{H}_2\text{O}) \text{m}^{-2} \text{s}^{-1}$]; iWUE - intrinsic water use efficiency [$\mu\text{mol mmol}^{-1}$]; E - transpiration rate [$\text{mmol m}^{-2} \text{s}^{-1}$]; SDadx - stomatal density on adaxial [mm^{-2}]; SDabx - stomatal density on abaxial [mm^{-2}]; EDadx - epidermal cell density on adaxial [mm^{-2}]; EDabx - epidermal cell density on abaxial [mm^{-2}]; SIadx - stomatal index on adaxial; SIabx - stomatal index on abaxial; LL - leaf length [cm]; LW - leaf width [cm].

No.	Genotype	CID	P_N	g_s	iWUE	E	SDadx	SDabx	EDadx	EDabx	SIadx	SIabx	LL	LW
1	Luohan 6	18.17	14.49	0.46	52.17	5.31	78.29	55.26	380.26	342.76	17.09	13.85	14.59	1.78
2	Hanyou 98	18.28	13.80	0.34	61.69	4.85	67.11	51.32	365.79	365.13	15.49	12.32	13.20	1.52
3	Zhonghan 110	18.36	14.43	0.36	56.65	4.59	80.26	55.92	407.24	340.79	16.46	14.09	15.93	1.65
4	Changwu 134	18.23	16.00	0.44	61.93	6.26	90.13	64.47	444.08	386.84	16.87	14.29	11.38	1.27
5	Jinmai 47	18.57	17.65	0.47	67.54	6.77	79.61	55.92	349.34	323.03	18.56	14.76	15.43	1.37
6	Changwu 863	18.08	15.17	0.44	67.28	6.51	84.87	66.45	400.00	353.95	17.50	15.84	13.07	1.29
7	Changwu 521-7	18.25	15.77	0.40	65.98	6.47	81.58	60.53	409.21	349.34	16.62	14.90	12.10	1.41
8	Shan 229	18.75	17.13	0.55	44.70	5.89	70.39	55.26	364.47	325.66	16.18	14.51	13.25	1.55
9	Xiaoyan 6	18.73	14.55	0.36	60.75	5.94	74.34	55.92	373.03	313.16	16.63	15.16	14.21	1.43
10	Shaanmai 168	18.78	15.73	0.43	53.83	6.06	73.68	61.18	402.63	358.55	15.48	14.61	15.86	1.46
11	Pubing 201	18.95	16.06	0.46	49.73	6.03	72.37	53.29	336.18	290.79	17.71	15.49	16.89	1.83
12	Shaan 512	19.10	18.38	0.50	43.85	6.10	78.95	56.58	378.95	349.34	17.25	13.93	14.54	1.52
13	Xiaoyan 22-3	18.39	11.40	0.29	52.85	4.67	78.29	52.63	387.50	340.79	16.81	13.38	14.60	1.83
14	Pubing 143	17.80	14.85	0.37	59.81	6.28	86.18	63.82	384.21	372.37	18.36	14.68	16.52	1.47
15	Xinong 389	18.64	17.24	0.40	65.11	6.84	82.24	55.92	385.53	339.47	17.60	14.15	15.08	1.66
16	Liken 2	17.94	15.15	0.34	55.55	5.58	80.92	61.84	401.97	384.87	16.76	13.86	16.60	1.46
17	Lantian 10	18.54	14.10	0.33	83.93	6.83	76.97	62.50	390.13	352.63	16.47	15.06	16.61	1.49
18	Xinong 811	19.05	18.17	0.47	48.99	6.08	63.82	50.66	344.08	316.45	15.64	13.81	17.95	2.02
19	Jing 411	18.92	15.70	0.42	62.85	6.57	80.26	59.21	420.39	378.29	16.03	13.52	14.30	1.50
20	Jinan 18	18.87	16.07	0.41	57.18	6.05	79.61	57.89	392.11	328.95	16.89	14.98	15.78	1.75
21	Qinnong 712	18.88	16.66	0.40	51.04	5.71	67.11	57.89	431.58	341.45	13.49	14.52	14.57	1.42
22	Changwu 58-61	18.11	10.33	0.23	55.33	3.35	80.92	60.53	401.97	342.11	16.77	15.10	17.79	1.74
23	Jing 2001	18.19	12.68	0.28	60.45	5.38	81.58	54.61	387.50	337.50	17.42	13.93	19.60	1.67
24	Mianyang 11	18.23	12.56	0.23	62.63	4.01	76.32	53.95	359.87	306.58	17.49	14.96	15.10	1.61
25	Jining 18	18.34	12.24	0.28	61.96	5.51	75.66	57.89	375.00	338.82	16.79	14.61	17.26	1.49
26	Xinmai 19	19.08	14.80	0.31	62.60	6.06	76.32	58.55	353.95	290.13	17.73	16.84	13.63	1.61
27	Zhou 17	19.16	17.51	0.50	44.30	7.17	84.87	65.79	344.74	305.92	19.77	17.74	12.15	1.52
28	Zhou 19	18.24	12.27	0.32	58.86	5.48	69.08	59.87	298.03	286.84	18.90	17.33	13.83	1.64
29	Yuanfeng 175	18.38	17.74	0.49	47.49	6.59	70.39	52.63	338.16	304.61	17.25	14.74	13.64	1.88
30	Yuanfeng 139	18.72	16.07	0.40	51.82	6.43	73.03	53.29	341.45	299.34	17.61	15.10	14.64	1.72
31	Xinong 889	18.84	14.83	0.31	59.89	5.72	64.47	51.97	336.18	337.50	16.09	13.33	16.64	1.73
32	Xinong 979	18.71	14.69	0.32	52.20	5.21	67.76	51.32	366.45	294.74	15.60	14.85	15.40	1.56
33	Xinong 928	18.65	14.74	0.29	62.95	5.81	73.68	59.21	370.39	310.53	16.61	16.02	15.31	1.59

Table 9 Suppl. Phenotypic data of 26-genotypes for association analysis with SNPs in 1 108 bp of *TaER-2*. For more detail see Table 8.

No.	Genotype	CID	P _N	g _s	iWUE	E	SDadx	SDabx	EDadx	EDabx	Sladx	Slabx	LL	LW
1	Yunhan 22-33	18.45	15.24	0.38	43.77	4.16	82.24	65.13	385.53	360.53	17.57	15.31	6.79	15.24
2	Shijiazhuang 8	18.34	17.48	0.41	48.67	4.87	82.24	51.32	399.34	338.82	17.08	13.15	8.99	12.75
3	Hanyou 98	18.28	13.80	0.34	61.69	4.85	67.11	51.32	365.79	365.13	15.49	12.32	8.38	13.20
4	Changwu 134	18.23	16.00	0.44	61.93	6.26	90.13	64.47	444.08	386.84	16.87	14.29	8.56	11.38
5	Changwu 863	18.08	15.17	0.44	67.28	6.51	84.87	66.45	400.00	353.95	17.50	15.84	9.74	13.07
6	Changwu 521-7	18.25	15.77	0.40	65.98	6.47	81.58	60.53	409.21	349.34	16.62	14.90	9.62	12.10
7	Xiaoyan 6	18.73	14.55	0.36	60.75	5.94	74.34	55.92	373.03	313.16	16.63	15.16	7.91	14.21
8	Pubing 201	18.95	16.06	0.46	49.73	6.03	72.37	53.29	336.18	290.79	17.71	15.49	9.40	16.89
9	Shan 512	19.10	18.38	0.50	43.85	6.10	78.95	56.58	378.95	349.34	17.25	13.93	9.01	14.54
10	Xiaoyan 22-3	18.39	11.40	0.29	52.85	4.67	78.29	52.63	387.50	340.79	16.81	13.38	7.42	14.60
11	Pubing 143	17.80	14.85	0.37	59.81	6.28	86.18	63.82	384.21	372.37	18.36	14.68	8.52	16.52
12	Xinong 389	18.64	17.24	0.40	65.11	6.84	82.24	55.92	385.53	339.47	17.60	14.15	9.48	15.08
13	Liken 2	17.94	15.15	0.34	55.55	5.58	80.92	61.84	401.97	384.87	16.76	13.86	10.10	16.60
14	Xinong 811	19.05	18.17	0.47	48.99	6.08	63.82	50.66	344.08	316.45	15.64	13.81	9.90	17.95
15	Jing 411	18.92	15.70	0.42	62.85	6.57	80.26	59.21	420.39	378.29	16.03	13.52	9.36	14.30
16	Qinnong 712	18.88	16.66	0.40	51.04	5.71	67.11	57.89	431.58	341.45	13.49	14.52	9.20	14.57
17	Ligao 6	19.14	16.69	0.50	49.88	6.80	67.76	53.29	292.11	299.34	18.86	15.11	9.86	13.17
18	Jining 13	18.83	13.45	0.35	59.22	5.67	71.71	57.24	356.58	301.32	16.86	15.99	10.86	19.53
19	Xinmai 19	19.08	14.80	0.31	62.60	6.06	76.32	58.55	353.95	290.13	17.73	16.84	7.99	13.63
20	Zhou 7	19.16	17.51	0.50	44.30	7.17	84.87	65.79	344.74	305.92	19.77	17.74	7.50	12.15
21	Yuanfeng 175	18.38	17.74	0.49	47.49	6.59	70.39	52.63	338.16	304.61	17.25	14.74	7.88	13.64
22	Yuanfeng 139	18.72	16.07	0.40	51.82	6.43	73.03	53.29	341.45	299.34	17.61	15.10	9.64	14.64
23	Xinong 889	18.84	14.83	0.31	59.89	5.72	64.47	51.97	336.18	337.50	16.09	13.33	8.58	16.64
24	Xinong 979	18.71	14.69	0.32	52.20	5.21	67.76	51.32	366.45	294.74	15.60	14.85	8.70	15.40
25	Xinong 928	18.65	14.74	0.29	62.95	5.81	73.68	59.21	370.39	310.53	16.61	16.02	9.67	15.31
26	Xiaoyan 81	18.98	16.28	0.43	39.04	5.68	66.45	50.66	329.61	338.16	16.79	13.08	8.96	17.52